FINAL REPORT

TRAFFIC OPERATIONS ANALYSIS REPORT

SR-210 MIXED FLOW LANE ADDITION FROM HIGHLAND AVENUE (PM R25.0) TO SAN BERNARDINO AVENUE (PM R33.2) IN THE COUNTY OF SAN BERNARDINO

EA 0C700

Prepared for

SAN BERNARDINO ASSOCIATED GOVERNMENTS

In conjunction with

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TRAFFIC OPERATIONS ANALYSIS

1.0 INTRODUCTION

This report presents the results of the traffic operations analysis conducted for the State Route 210 (SR-210) Mixed Flow Lane Addition Project ("Project') in San Bernardino County. The proposed improvements are located within Caltrans District 8 jurisdiction, from post mile (PM) R25.0 to R33.2. The traffic study area includes the freeway mainline and ramp merge and diverge areas from west of Highland Avenue/Arden Avenue to east of San Bernardino Avenue. The scope and Purpose and Need of the project focuses primarily on the mainline segment lane addition and associated improvements only. The project proposes to add one mixed flow lane in each direction within the median of SR-210, create auxiliary lanes between the Base Line and Fifth Street interchanges and add an acceleration lane at the eastbound Fifth Street on-ramp. The auxiliary lanes between Base Line and 5th Street will be created by extending the existing deceleration lanes at the off-ramps back to the adjacent interchange's on-ramps.

Existing (2012), Opening Year (2020) and Horizon Year (2040) conditions were analyzed in this traffic operations analysis report. Existing (2012) used as baseline which is the year that environmental studies were initiated.

Background

A Project Study Report/Project Development Support (PSR/PDS) was approved in 2008. The PSR/PDS had originally called for providing one additional mixed flow lane in each direction from Highland Avenue to San Bernardino Avenue and one new HOV lane in each direction from I-215 to I-10. The current project is to provide one additional mixed flow lane in each direction from Highland Avenue to San Bernardino Avenue plus associated auxiliary lane and acceleration lane improvements.

The SR-210 Mixed Flow Lane Addition Project is located within the Valley Region Planning Area as described in the San Bernardino County General Plan. The cities of Highland in the north and Redlands in the south surround much of the project study area. Adjacent jurisdictions include the City of San Bernardino and unincorporated areas of San Bernardino County.

State Route 210 (SR-210)

State Route 210 (SR-210), refers to the eastern segment and extension of Interstate 210 (I-210). SR-210 comprises the segment starting at the east end of the I-210, in the City of San Dimas, and extends eastward for approximately 33.2 miles, reaching the terminus at Interstate 10 in the City of Redlands. Within the project limits, the SR-210 provides adjacent junctions onto Interstate 15, Interstate 215, State Route 259, State Route 18, State Route 330, Interstate 10 and, adjacent interchanges onto Highland Avenue, Base Line, 5th Street/Greenspot Road and San Bernardino Avenue. A new future service interchange is under consideration at Victoria Avenue, 0.6 miles east of the Highland Avenue interchange and 1.3 miles west of the SR-210 to SR-330 interchange, approximately at PM R27.8. SR-210 is included in the National Highway System, the California Freeway and Expressway System and the "12 foot Wide Arterial System". The SR-210, within the project limit, is classified as a Principal Arterial highway.

West of the Project (west of Highland Avenue) SR-210 consists of three mixed flow lanes in each direction. East of the Project (east of San Bernardino Avenue) SR-210 consists of four mixed flow lanes in each direction.

State Route 330 (SR-330)

State Route 330 (SR-330) is a 15 mile freeway/conventional two-lane highway where the westerly segment begins at the junction of the SR-210 and extends northeasterly to SR-18. SR-330 is mostly considered a conventional two-lane highway as only the initial 1-mile segment from the junction at SR-210 is constructed to freeway standards. SR-330 is located within San Bernardino County and is utilized as one of the main accesses into the cities of Big Bear and Lake Arrowhead. Access from east/westbound SR-210, onto northbound SR-330 is provided via connector ramps and access onto east/westbound SR-210 from southbound SR-330 is provided also via connector ramps.

Interstate 10 (I-10)

Interstate 10 (I-10), within the state of California, is a major east-west interstate highway that spans approximately 250 miles starting in the City of Santa Monica and ending in the City of Blythe. The segment of I-10 adjacent to the Project, where it serves as the terminus for the SR-210, is located at post mile marker 77.3. Access between east/westbound SR-210 and east/westbound I-10 is provided via connector ramps.

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SR-210 Mixed Flow Lane Addition
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Figure 1
Project Location Map

2.0 TRAVEL DEMAND FORECAST MODEL

This section discusses the traffic forecast model developed by SANBAG specifically for use within San Bernardino County. The current SANBAG model is a sub-regional (subset) of the regional Southern California Associated Governments (SCAG) Model and incorporates more refined local details otherwise not included in larger scale regional models. The SANBAG Model incorporates elements of the most recent Regional Transportation Plan (RTP) (2012-2035) as compared to the earlier SCAG Model used in the preparation of the 2008 PSR/PDS document for this project.

The development of the San Bernardino County Transportation Analysis Model (SBTAM) was completed in June 2012, in partnership with Southern California Association of Governments (SCAG).

SBTAM Model Background

According to SANBAG, the San Bernardino Transportation Analysis Model, (SBTAM) "replaces the former RIVSAN subregional travel demand model, which is no longer being supported by SCAG. The model is designed as the primary travel demand forecasting tool for use throughout San Bernardino County, including the Valley, Victor Valley, Morongo Basin, and other Mountain/Desert subareas. Some of the anticipated uses of SBTAM include: highway design and environmental studies, traffic impact analysis reports for development projects, general plans, land use policy analysis, and subregional transportation studies. SBTAM will also be used for development of the County Transportation Plan, being initiated in Fiscal Year 2012-2013."

SANBAG Traffic Modeling Data

SANBAG currently has the 2008 and 2035 San Bernardino Traffic Analysis Model (SBTAM) traffic model networks applicable for the proposed project and study area. The current SBTAM model had been modified to reflect the no build and build conditions of the proposed project for traffic forecasting needs.

The applicable 2008 and 2035 SBTAM model forecast output volumes were provided by SANBAG. The provided model data, however, are mixed-flow traffic volume forecast only, and do not contain separate truck only model forecast volumes.

Project SBTAM Traffic Modeling Scenarios

The following traffic modeling data scenarios and detailed content description were used in the development of project opening year (2020) and project design year (2040) No Build and Build conditions.

<u>Future Year No Build Alternative (2035):</u>

- Include all programmed improvements from the RTP, except:
  - Delete the SR-210 Mixed Flow Lane Addition Project and all of its associated improvements from Highland Avenue to San Bernardino Avenue (i.e. this segment should generally be modeled as 2 mixed flow lanes in each direction);
  - Delete the proposed auxiliary lanes between Base Line and 5th Street;

  - Delete the proposed southbound acceleration lane at the 5th Street on-ramp.
- Include all of the SR-210/Base Line Interchange Improvement Project improvements (including widening Base Line from Church Avenue to Boulder Avenue and widening the ramps).

Future Year Build Alternative (2035):

- Include all programmed improvements from the RTP with the exception of the SR-210 HOV lanes.
- Include all of the SR-210 Mixed Flow Lane Addition Project improvements.

Model Conversion and Post Processing Methodology

The traffic model post-processing methodology follows and is consistent with SANBAG's future forecasting standards and requirements as outlined in *Appendix H – Post Processed Traffic Volume Guidelines* from the San Bernardino County CMP documentation.

SANBAG's traffic modeling output is expressed in terms of peak period traffic forecasts. In order to utilize the data, SANBAG has developed conversion factors to convert peak period volumes into usable peak hour volumes for use in the traffic analysis, which are summarized below.

Model Conversion Factors

The following conversion factors are applied to derive peak period traffic volume forecast from the traffic model peak period volume forecast. The intent is to develop usable peak hour AM/PM analysis volumes from the peak period AM/PM forecast.

Passenger Car Model

AM peak hour = 0.38 x AM peak period
PM peak hour = 0.28 x PM peak period

Traffic Model Projections for 2020 Project Opening and 2040 Future Year Project Conditions

Based on the traffic modeling updates described above, SANBAG had developed Year 2008 and Year 2035 Model run forecasts which were subsequently post-processed to develop Opening Year 2020 and Horizon Year 2040 traffic volume projections.

Consistent with the methodology used in similar projects in the area and as an acceptable method with SANBAG, the forecasted traffic volume differential between the 2008 and 2035 conditions was used to determine an annualized growth rate. Using Year 2012 as the pivot year, the annualized growth factors were used to develop Opening Year 2020 and Horizon Year 2040 projected traffic volumes. This straight-line extrapolation may over or under predict future volumes; however, it is considered an acceptable method of estimation for planning purposes given the overall accuracy level of the model's future year forecasts.

The results of the traffic model forecast post processing is summarized in Appendix A.

Related Projects in the Study Area

In addition to the proposed SR-210 Mixed Flow Lane Addition project (the project) the following projects are planned within the limits of the project. These projects are included in the 2035 San Bernardino Traffic Analysis Model (SBTAM) and were reviewed in the development of the Mixed Flow Lane Addition project traffic analysis modeling.

SR-210/Base Line Interchange Improvement Project

This project is included as a Financially Constrained Project (RTP ID 4M07007) in the SCAG 2012-2035 RTP. This improvement includes widening of at the ramps and ramp terminal junctions and is included in both 2035 No Build and Build Model.

SR-210/Victoria Avenue Interchange Project

A Project Study Report/Project Development Support (PSR/PDS) for the SR-210/Victoria Avenue Interchange was approved by Caltrans on April 8, 2011 to evaluate the feasibility of constructing a new interchange within the city limits of Highland and San Bernardino on SR-210 at Victoria Avenue. This project is included as a Financially Constrained Project (RTP ID 4M0801) in the SCAG 2012-2035 RTP. This project is included in both the 2035 No Build and Build Models.

SR-210 HOV Lane Addition Project

This project calls for the addition of one HOV lane in each direction between I-215 and I-10. Based on the 2012-2035 RTP, the HOV project is also in the Financially Constrained Project list. In order to assess the environmental impacts of the Mixed Flow Lane Addition project, the HOV Lane Addition project was not included in the 2035 No Build model used in the analysis. Consistent with the No Build assumption, the HOV Lane Addition project was similarly not included in the 2035 Build model. This approach ensures consistency of assumptions used in the evaluation of the traffic impacts for the Mixed Flow Lane Addition project.

3.0 ANALYSIS METHODOLOGY

This report documents the evaluation of the traffic operations of the SR-210 Mixed Flow Lane Addition Project (the “project”) which is generally defined as the segment of SR-210 between Highland Avenue/Arden Avenue and San Bernardino Avenue. The analysis evaluated Existing (2012) conditions, Opening Year (2020) conditions and Horizon Year (2040) conditions.

In consultation with Caltrans District 8 staff, the project traffic operational analysis was conducted in accordance with the procedures outlined in the 2010 Edition of the Highway Capacity Manual which hereinafter will also be referred to as “HCM 2010” or “HCM”. The HCM 2010 offers a significant update to the analysis procedures outlined from the previous version, HCM 2000.

As described in Volume 2 (“Uninterrupted Flow”) of the HCM 2010, and for purposes of evaluating the proposed project, SR-210 will be divided into various segments for analysis. Descriptions of the freeway facility components and the methodologies used to analyze them are described below.

Basic Freeway Segments

A basic freeway segment is a section of the freeway mainline which is not within a ramp influence area (i.e., not within 1,500 feet of a ramp junction) or weaving segment. Adding or dropping a lane results in the termination of a basic freeway segment. Peak hour volumes on basic freeway segments are analyzed using the methodology described in the *HCM* Chapter 11 ("Basic Freeway Segments") and Highway Capacity Software (HCS 2010, Version 6.4).

The TOAR did not evaluate segments between off and on ramps (within the interchanges) since mainline freeway segment operations within these areas will always result in levels of service as good or better than the upstream mainline segments prior to the interchanges.

The upgraded HCS 2010, Version 6.4 implements and automates the HCM 2010 procedures and includes modules to implement the new procedures for Basic Freeway Segments and will be used in the evaluation of the proposed project. **Table 1** provides the LOS criteria for basic freeway segments characterized by three performance measures, namely: density in passenger cars per mile per lane (*pc/mi/ln*), space mean speed in miles per hour (mi/h), and ratio of demand flow rate (volume) to capacity (*v/c*).

According to the HCM 2010, "speed is a constant through a broad range of flows and the v/c ratio is not directly discernible to road users (except at capacity), the service measure for basic freeway segments is density."

Table 1: LOS Criteria for Basic Freeway Segments

LOS	Density (pc/mi/ln)
A	≤11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
	Demand exceeds capacity
F	>45

Source: Exhibit 11-5 from Highway Capacity Manual 2010.

Determining free-flow speed (FFS)

According to the HCM, the freeway FFS is best measured in the field, however, sometimes it is not possible to make field measurements e.g. future design for future facilities. In this instance, the segment's FFS may be estimated by using ***Equation 11-1*** of the HCM, which is based on the physical characteristics of the segment under study and is illustrated below:

$$FFS = 75.4 - f_{LW} - f_{LC} - 3.22\,TRD^{0.84}$$

where

FFS = FFS of basic freeway segment (mi/h)
f_{LW} = adjustment for lane width (mi/h)
f_{LC} = adjustment for right-side lateral clearance (mi/h), and
TRD = total ramp density (ramps/mi)

Weave Segments

The HCM 2010 defines weaving as the crossing of two or more traffic streams traveling in the same direction along a significant length of highway without the aid of traffic control devices or guide signs. Weave segments occur when merge segments are closely followed by diverge segments. The "close" condition implies that there is not sufficient distance between the merge and diverge segments for them to operate independently from each other.

Peak hour volumes within the freeway weaving sections are analyzed using the methodology contained in *HCM* Chapter 12 ("Freeway Weaving Segments"). A weaving segment's performance is primarily influenced by three key geometric characteristics, namely: length, width and configuration. An eight-step HCM flowchart shown in Chapter 12, Exhibit 12-6 Weaving Methodology Flowchart describes the basic steps that define the methodology for analyzing freeway weaving segments.

The upgraded HCS 2010, Version 6.4 implements and automates the HCM 2010 procedures and includes modules to implement the new procedures for Weave Segments and will be used in the evaluation of the proposed project. The LOS criteria for weaving segments are described in **Table 2**.

Table 2: LOS Criteria for Weaving Segments

LOS	Density (pc/mi/ln)
A	0-10
B	> 10-20
C	> 20-28
D	> 28-35
E	> 35
F	Demand exceeds capacity

Source: Exhibit 12-10 from Highway Capacity Manual 2010.

Determining weaving speeds

According to the HCM, the heart of the weaving segment methodology is the estimation of average speeds of weaving and non-weaving vehicles in the weaving segment. These speeds are estimated separately because they are affected by various factors and can be significantly different from each other. The algorithm for predicting the average speed of weaving vehicles in a weaving segment is illustrated by ***Equation 12-17*** of the HCM.

In cases that require the FFS to be estimated, the methodology described in Chapter 11, Basic Freeway Segments is used. The average speed of weaving vehicles within the weaving segment is estimated by using ***Equations 12-8*** and ***12-9*** of the HCM.

Freeway Merge and Diverge Segments

The following five-step *HCM* 2010 methodology is used to analyze ramp-freeway junctions calibrated specifically for one-lane, right-side ramp freeway junctions applicable for merge and diverge segments. Specific details of the computational steps and directions are provided in Chapter 13 ("Freeway Merge and Diverge Segments") of the *HCM*. For all other cases such as two-lane ramp junctions, left side ramps and major merge and diverge configurations, the analyses are conducted according to the procedures outlined in the Special Cases Section.

Step 1 – Specify Inputs and Convert Demand Volumes to Demand Flow.

Step 2 – Estimate the Approaching Flow Rate in Lanes 1 and 2 of the Freeway Immediately Upstream of the Ramp Influence Area.

Step 3 – Estimate the Capacity of the Ramp-Freeway Junction and Compare with Demand Flow Rates.

Step 4 – Estimate Density in the Ramp Influence Area and Determine the Prevailing LOS.

Step 5 – Estimate Speeds in the Vicinity of Ramp-Freeway Junctions.

The above steps are illustrated in the HCM 2010, Exhibit 13-4 Flowchart for Analysis of Ramp-Freeway Junctions. According to the HCM, other freeway lanes may be affected by merging or diverging maneuvers, but the defined area within 1,500 feet of the ramp junction generally experiences the greatest impacts across all Level of Service. Based on Figures 504.2A and 504.2B in the *Highway Design Manual (HDM)*, as per California design standards, the default

acceleration and deceleration lengths employed in the evaluation of ramp merge and diverge areas are 600 feet and 141 feet, respectively.

The upgraded HCS 2010, Version 6.4 implements and automates the HCM 2010 procedures described above and includes modules to implement the new procedures for Freeway Merge and Diverge Segments and will be used in the evaluation of the proposed project. The LOS criteria for merge and diverge segments are described in Table 3 below.

Table 3: LOS Freeway Merge and Diverge Segments

LOS	Density (pc/mi/ln)	Comments
A	0-10	Unrestricted operations
B	> 10-20	Merging and diverging maneuvers noticeable to drivers
C	> 20-28	Influence area speeds begin to decline
D	> 28-35	Influence area turbulence becomes intrusive
E	> 35	Turbulence felt by virtually all drivers
F	Demand exceeds capacity	Ramp and freeway queues form

Source: Exhibit 13-2 from Highway Capacity Manual 2010.

Determining free-flow speed (FFS)

The HCM 2010 recommends that the freeway FFS is best measured in the field. However, if field measurements are not available, FFS for Freeway Merge and Diverge Segments may be estimated using the methodology used to determine the FFS for basic freeway segments presented in Chapter 11, Basic Freeway Segments.

4.0 EXISTING (2012) TRAFFIC CONDITIONS

The existing SR-210 mainline within the project limits is generally a four-lane freeway facility. Freeway ramps are provided at Highland Avenue and Arden Avenue, freeway connectors are provided at the SR-330 Junction, and interchanges currently exist at Base Line, 5th Street and San Bernardino Avenue. This section of the report presents the existing freeway operations analysis results.

Existing Volumes

Existing mainline counts were developed based on weekday (Tuesday, Wednesday, and Thursday) data from Caltrans' Traffic Data Report (15 Minute Loop Data) for the period between October 16 and October 25, 2012. The 15 minute loop counts are provided for five locations for AM and PM peak hours, 6-9 AM and 3-7 PM respectively. The five locations along SR-210 mainline are located at Post Miles (PM) 26.25, 28.7, 30.1, 31.4 and 32.6. For each location, the maximum hourly flow within the peak period is selected and an average is taken for all the days that data is available. The Existing 2012 freeway mainline traffic count data sheets are provided in Appendix C. Additionally, the SR-210 Traffic Volume summary is provided in Appendix C that shows the development of the traffic volume data from Existing 2012 to Year 2020 and Year 2040 conditions.

The 2012 ramp volume development methodology was conducted following the development and finalization of the existing SR-210 mainline flow along the freeway study segments. A combination of resources (including the SR-210 2008 PSR/PDS and 2008 SBTAM baseline forecast) were consulted to develop the ramp volumes along the study corridor. Since no existing ramp counts are available at the study corridor ramps, the SR-210 2008 PSR/PDS ramp and freeway flow data were utilized to establish the ramp-to-freeway volume split at each interchange. The Existing 2012 ramp volumes developed for this report were calculated based on either the SR-210 2008 PSR/PDS split or by applying flow conservation along the freeway.

Truck percentages were derived from the Caltrans Traffic Data Branch 2010 database and a passenger car equivalent (PCE) factor of 1.5 was applied to trucks in the Highway Capacity Software (HCS) analysis. Since ramp truck percentage values were not available, the mainline truck percentage assumptions were similarly used in the weaving, merge and diverge analysis.

Existing mainline ADT data were developed based on the existing peak hour directional volumes described above and using peak hour and ADT relationship using published Caltrans Traffic Database K and D factors table provided in Appendix C. Key steps and factors in the ADT volume development include the following:

$$AADT = PHV/KxD$$

where

K = The percentage of the AADT in both directions during the peak hour. Values in the Caltrans table are derived by dividing the measured 2-way PHV by the AADT.

D = D factor. The percentage of traffic in the peak direction during the peak hour. Values in the traffic count book are derived by dividing the measured PHV by the sum of both directions of travel during the peak hour.

KxD = The product of K and D. The percentage of AADT in the peak direction during the peak hour. Values in the Caltrans table are derived by dividing the measured 1-way PHV by the AADT.

PHV = Peak Hour Volume in the peak direction. A one way volume in vehicles per hour (vph) as used here. The PHV is analogous to the DDHV as used for design purposes.

AADT = Annual Average Daily Traffic in vehicles per day. (Derived here in this TOAR as ADT)

- Identify applicable K and D factors within the study area – Existing 2011 SR-210 K & D Factor at PM 31.72 between the San Bernardino Avenue and 5th Street-Greenspot Road. These are the only available published K and D factors for the project study segments. The source table for the K and D factors are provided in Appendix C.

- Apply K and D factors to the previously developed peak hour ramp volumes and compare ADT results between corresponding movements in the eastbound and westbound direction. For analysis purposes, it was conservaltively assumed that the higher calculated directional ADT was selected and applied to both directions. Theoretically, opposing directional ADT's are anticipated to be equal by direction on a daily basis.

- Using the mainline segment between San Bernardino Avenue and 5th Street-Greenspot Road as the starting point, the mainline ADT at this location was developed using the aforementioned K and D factors. The resulting mainline ADT was propagated through the study segments using the principles of flow conservation and taking into consideration the derived ramp ADTs.

Existing Truck Data

Based on the review of the latest 2011 and 2010 truck volume data from Caltrans Traffic Data Branch, the review indicated no usable 2011 data for the SR-210 freeway study segments within the project limits. However, the 2010 truck count data showed a combination of verified and estimated truck counts within the project limits. Additional research yielded no further information beyond those presented in the Caltrans Traffic Data Branch 2010 truck count data.

Using the 2010 truck data, we have used existing and future year truck percentage of 7 percent between Highland Avenue and SR-330 and 6 percent between SR-330 and San Bernardino

Avenue for both mainline and ramp area analysis. The aforementioned truck percentages were similarly adopted and used in the TI Analysis.

Existing Traffic Conditions

Figure 2 illustrates the roadway lane geometrics for existing conditions. **Figure 3** illustrates the SR-210 mainline and ramp ADT and peak hour volumes from Caltrans District 8. The existing 2012 count data are utilized as the starting point in the development of Opening Year 2020 and Horizon Year 2040 traffic forecast.

HCM 2010 operational analysis was conducted for existing conditions for the SR-210 study mainline, weaving, ramp merge and diverge areas within the project study limits. **Tables 4** and **5** summarize the density and level of service results of the analysis performed at the project study locations. The traffic analysis worksheets are provided in Appendix B.

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Figure 2
Existing (2012) Freeway Mainline and Ramp Geometrics

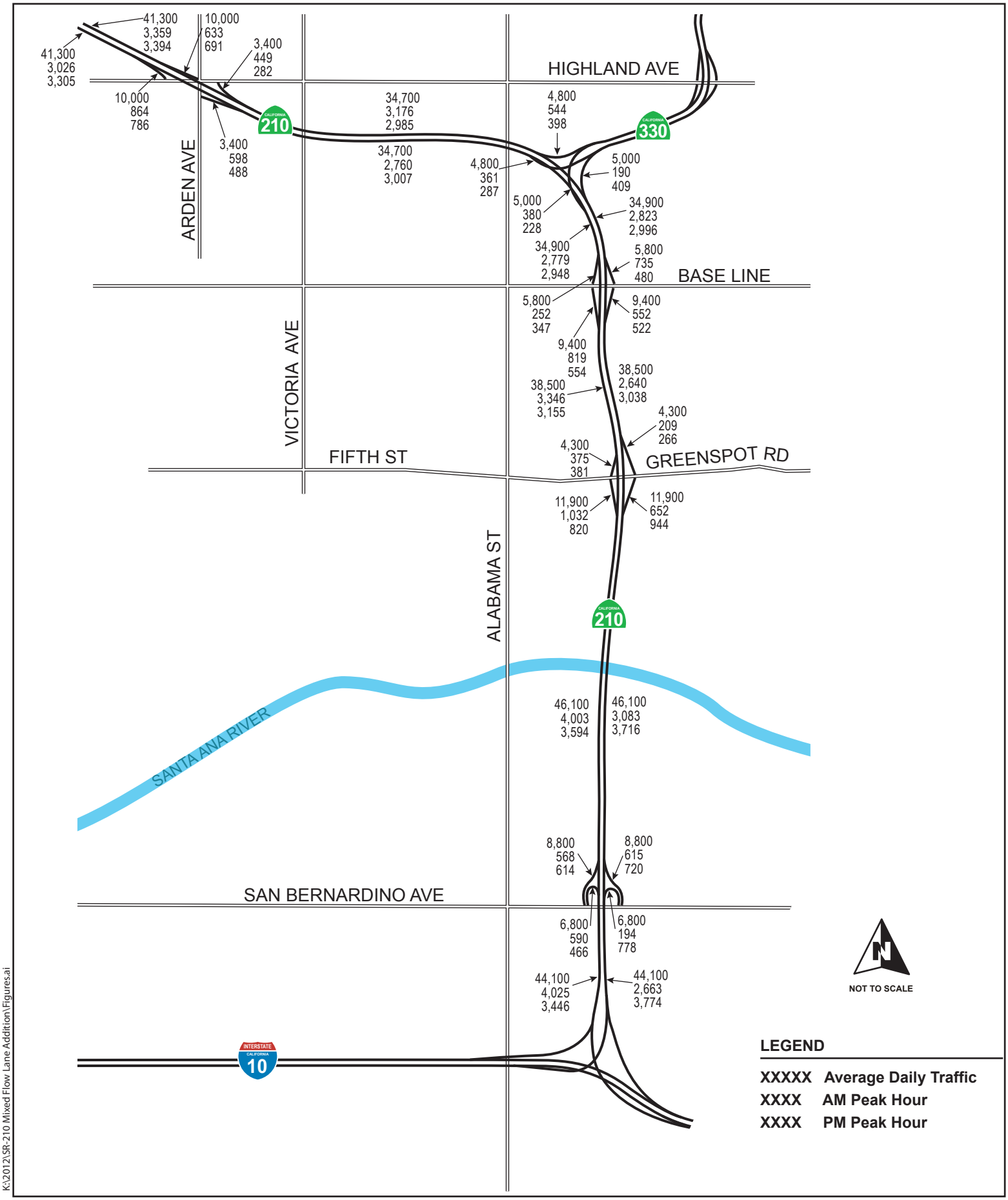

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Figure 3
Existing (2012) Freeway Mainline and Ramp Volumes

Table 4:
Existing (2012) - SR-210 Eastbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Existing (2012)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between Sterling Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	17.1	B	18.5	C
SR-210 Highland Avenue Off-ramp	Trap Lane	2MF/ 1L Trap	N/A[3]	N/A[3]	N/A[3]	N/A[3]
SR-210 Arden Avenue On-ramp	Merge	2MF/ 1L Ramp	25.1	C	27.0	C
SR-210 between Highland Avenue-Arden Avenue and SR-330	Freeway	2MF	23.4	C	25.5	C
SR-210 SR-330 Connector	Diverge	2MF/ 1L Decel	19.8	B	21.8	C
SR-210 between SR-330 and Base Line	Weave	2MF/ 1 Aux	17.8	B	18.4	B
SR-210 Base Line On-ramp	Merge	2MF/ 1L Ramp	29.9	D	28.1	D
SR-210 between Base Line and 5th Street-Greenspot Road	Freeway	2MF	29.4	D	26.9	D
SR-210 5th Street Off-ramp	Diverge	2MF/ 1L Ramp	28.2	D	26.1	C
SR-210 5th Street On-ramp	Merge	2MF/ 1L Ramp	35.4	**E**	31.7	D
SR-210 between 5th Street-Greenspot Road and San Bernardino Avenue	Freeway	2MF	39.1	**E**	32.1	D
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	28.5	D	26.3	C
SR-210 San Bernardino Avenue On-ramp	Merge	4MF/ 1L Ramp	18.2	B	15.5	B
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	17.0	B	14.4	B

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.

Table 5:
Existing (2012) - SR-210 Westbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Existing (2012)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	15.0	B	21.0	C
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	20.6	C	27.5	C
SR-210 San Bernardino Avenue On-ramp	Merge	2MF/ 1L Ramp	27.8	C	32.8	D
SR-210 between San Bernardino Avenue and 5th Street-Greenspot Road	Freeway	2MF	26.5	D	33.8	D
SR-210 Greenspot Road Off-ramp	Diverge	2MF/ 1L Ramp	32.0	D	37.6	**E**
SR-210 Greenspot Road On-ramp	Merge	2MF/ 1L Ramp	24.2	C	27.3	C
SR-210 between 5th Street-Greenspot Road and Base Line	Freeway	2MF	22.3	C	25.7	C
SR-210 Base Line Off-ramp	Diverge	2MF/ 1L Ramp	21.5	C	24.9	C
SR-210 between Base Line and SR-330	Weave	2MF/ 1 Aux	18.8	B	19.2	B
SR-210 SR-330 Connector	Merge	2MF/ 1L Ramp	28.8	D	26.9	C
SR-210 between SR-330 and Highland Avenue-Arden Avenue	Freeway	2MF	27.6	D	25.3	C
SR-210 Highland Avenue Off-ramp	Diverge	2MF/ 1L Ramp	33.1	D	31.0	D

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.

5.0 OPENING YEAR (2020) TRAFFIC CONDITIONS

The purpose of this chapter is to present and document the forecast future traffic conditions on the anticipated Opening Year (2020) of the proposed project. Opening year traffic volumes were developed for Opening Year (2020) No Build and Build conditions. Under Opening Year (2020) No Build Traffic Conditions, it was assumed that SR-210 would be geometrically identical to existing conditions and the other related SR-210 projects are assumed to be unconstructed and not implemented.

Opening Year (2020) mainline and ramp traffic count data has been developed using annualized growth factors described previously in Chapter 2 of this report. During Opening year (2020) traffic conditions, volume proportion/flow conservation has been maintained during the development of future mainline traffic count data and the truck percentage values for the mainline were also assumed for ramp traffic and was used in the weaving, merge and diverge analysis. In addition, the previously discussed truck percentages and the 1.5 PCE factor for trucks had been maintained for use in the Opening Year (2020) traffic operations analysis.

Opening Year (2020) - No Build Traffic Conditions

Figure 4 illustrates Opening Year (2020) - No Build Freeway Mainline and Ramp Geometric configurations. **Figure 5** illustrates Opening Year (2020) – No Build Freeway Mainline and Ramp ADT and peak hour traffic volumes.

An operational analysis was conducted for the SR-210 mainline, ramp merge and diverge areas within the project study area and the results are summarized in **Table 6** for the eastbound SR-210 direction and in **Table 7** for the westbound SR-210 direction.

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SR-210 Mixed Flow Lane Addition (PM R26.0/R33.2) - EA 0C700

Figure 4
Opening Year (2020) No Build Freeway Mainline and Ramps Geometrics

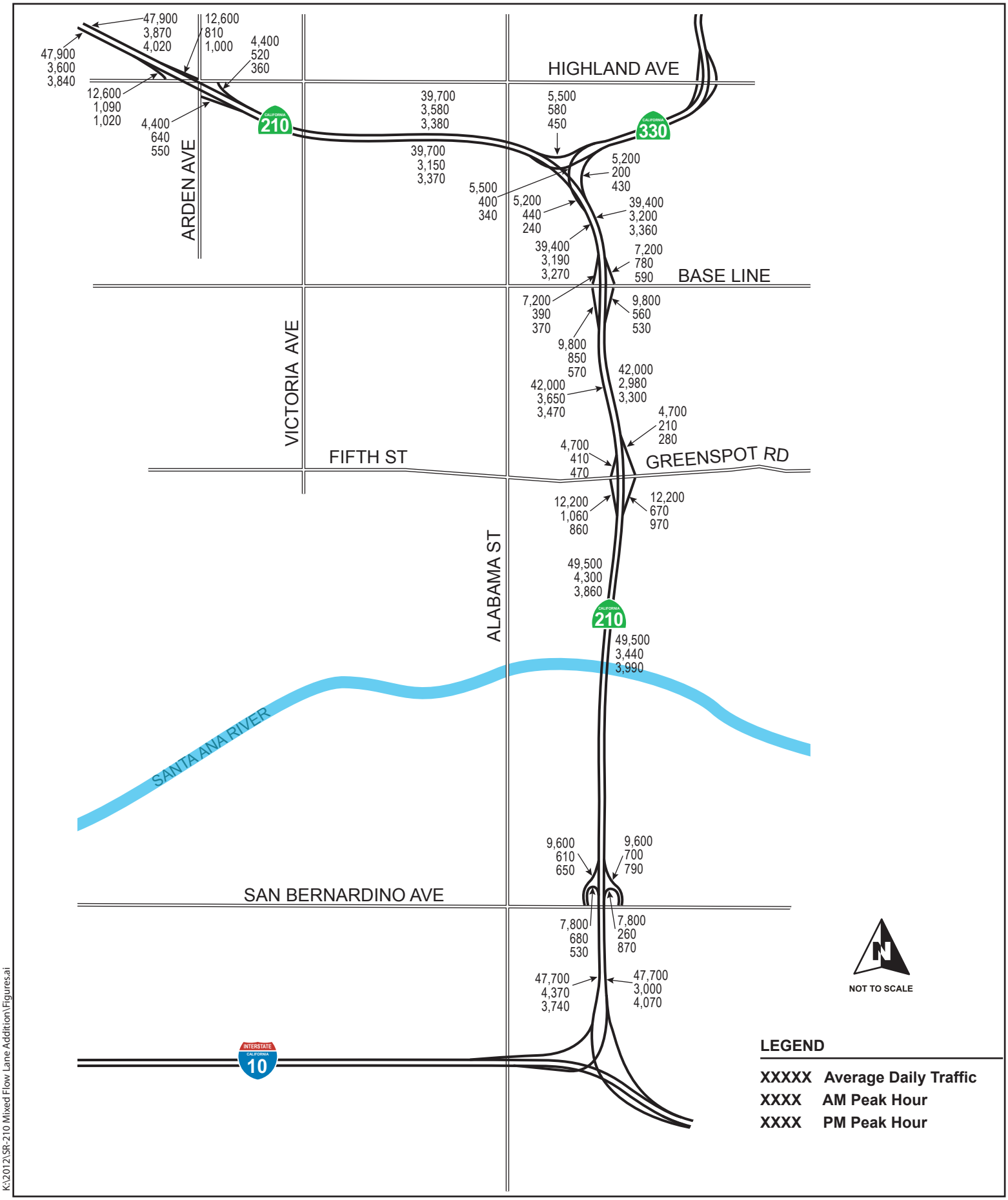

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Figure 5
Opening Year (2020) No Build Freeway Mainline and Ramp Volumes

Table 6:
Opening Year (2020) SR-210 - No Build Eastbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Opening Year (2020)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between Sterling Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	20.3	C	21.5	C
SR-210 Highland Avenue Off-ramp	Trap Lane	2MF/ 1L Trap	N/A[3]	N/A[3]	N/A[3]	N/A[3]
SR-210 Arden Avenue On-ramp	Merge	2MF/ 1L Ramp	28.4	D	30.1	D
SR-210 between Highland Avenue-Arden Avenue and SR-330	Freeway	2MF	27.3	D	29.5	D
SR-210 SR-330 Connector	Diverge	2MF/ 1L Decel	23.5	C	25.2	C
SR-210 between SR-330 and Base Line	Weave	2MF/ 1 Aux	20.7	C	20.6	C
SR-210 Base Line On-ramp	Merge	2MF/ 1L Ramp	32.5	D	30.8	D
SR-210 between Base Line and 5th Street-Greenspot Road	Freeway	2MF	33.4	D	30.5	D
SR-210 5th Street Off-ramp	Diverge	2MF/ 1L Ramp	31.1	D	29.0	D
SR-210 5th Street On-ramp	Merge	2MF/ 1L Ramp	--*	**F**	33.9	D
SR-210 between 5th Street-Greenspot Road and San Bernardino Avenue	Freeway	2MF	45.3	**F**	36.0	**E**
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	30.0	D	27.7	C
SR-210 San Bernardino Avenue On-ramp	Merge	4MF/ 1L Ramp	19.8	B	16.8	B
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	18.4	C	15.6	B

Notes: --* = Demand exceeds capacity.

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.

Table 7:
Opening Year (2020) SR-210 - No Build Westbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Opening Year (2020)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	16.9	B	22.7	C
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	22.6	C	29.2	D
SR-210 San Bernardino Avenue On-ramp	Merge	2MF/ 1L Ramp	30.8	D	35.1	**E**
SR-210 between San Bernardino Avenue and 5th Street-Greenspot Road	Freeway	2MF	30.6	D	38.1	**E**
SR-210 Greenspot Road Off-ramp	Diverge	2MF/ 1L Ramp	35.4	**E**	40.2	**E**
SR-210 Greenspot Road On-ramp	Merge	2MF/ 1L Ramp	27.1	C	29.5	D
SR-210 between 5th Street-Greenspot Road and Base Line	Freeway	2MF	25.4	C	28.5	D
SR-210 Base Line Off-ramp	Diverge	2MF/ 1L Ramp	24.7	C	27.4	C
SR-210 between Base Line and SR-330	Weave	2MF/ 1 Aux	21.7	C	22.0	C
SR-210 SR-330 Connector	Merge	2MF/ 1L Ramp	32.2	D	30.2	D
SR-210 between SR-330 and Highland Avenue-Arden Avenue	Freeway	2MF	32.6	D	29.6	D
SR-210 Highland Avenue Off-ramp	Diverge	2MF/ 1L Ramp	36.9	**E**	34.6	D

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.

Opening Year 2020 - Build Traffic Conditions

Figure 6 illustrates Opening Year (2020) – Build Freeway Mainline and Ramp Geometric configurations. **Figure 7** illustrates Opening Year (2020) – Build Freeway Mainline and Ramp ADT and peak hour traffic volumes.

Similar to Opening Year (2020) – No Build conditions, an operational analysis was conducted for Build Conditions of the SR-210 mainline, ramp merge and diverge areas within the project study area and the results are summarized in **Table 8** for the eastbound SR-210 direction and in **Table 9** for the westbound SR-210 direction.

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Figure 6
Opening Year (2020) Build Freeway Mainline and Ramp Geometrics

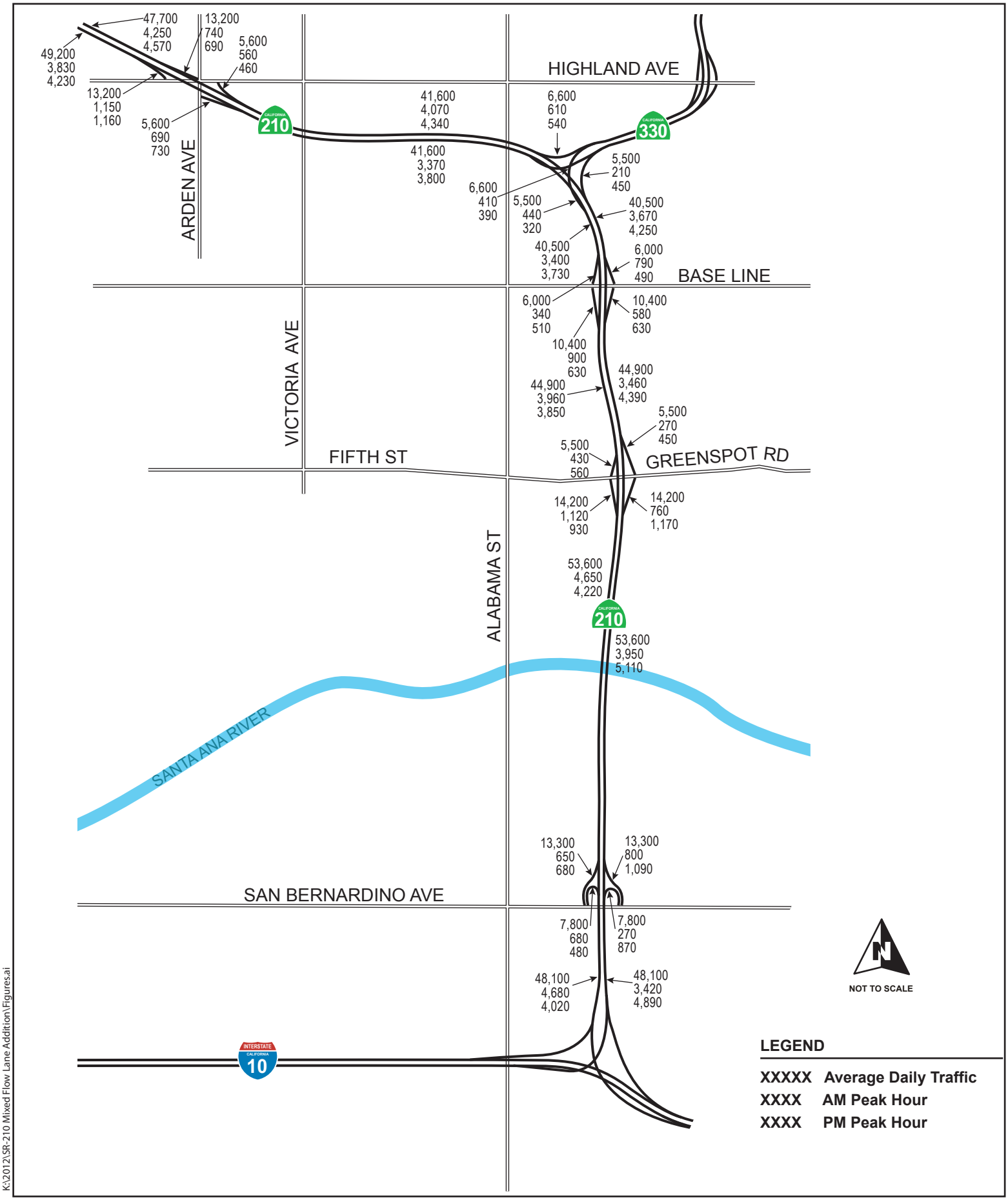

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Figure 7
Opening Year (2020) Build Freeway Mainline and Ramp Volumes

Table 8:
Opening Year (2020) SR-210 - Build Eastbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Opening Year (2020)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between Sterling Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	21.6	C	23.7	C
SR-210 Highland Avenue Off-ramp	Diverge	3MF/ 2L Ramp	19.4	B	20.9	C
SR-210 Arden Avenue On-ramp	Merge	3MF/ 1L Ramp	21.0	C	23.1	C
SR-210 between Highland Avenue-Arden Avenue and SR-330	Freeway	3MF	19.0	C	21.2	C
SR-210 SR-330 Connector	Diverge	3MF/ 1L Decel	15.7	B	17.7	B
SR-210 between SR-330 and Base Line	Weave	3MF/ 1 Aux	16.3	B	17.6	B
SR-210 Base Line On-ramp	Merge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between Base Line and 5th Street-Greenspot Road	Weave	3MF/ 1 Aux	21.3	C	20.1	C
SR-210 5th Street Off-ramp	Diverge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 5th Street On-ramp	Merge	3MF/ 1L Accel	28.7	D	25.6	C
SR-210 between 5th Street-Greenspot Road and San Bernardino Avenue	Freeway	3MF	26.6	D	23.5	C
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	31.7	D	29.5	D
SR-210 San Bernardino Avenue On-ramp	Merge	4MF/ 1L Ramp	20.9	C	17.5	B
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	19.7	C	16.8	B

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

Table 9:
Opening Year (2020) SR-210 – Build Westbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Opening Year (2020)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	19.2	C	28.0	D
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	24.9.	C	33.0	D
SR-210 San Bernardino Avenue On-ramp	Merge	3MF/ 1L Ramp	24.2	C	30.6	D
SR-210 between San Bernardino Avenue and 5th Street-Greenspot Road	Freeway	3MF	22.2	C	29.7	D
SR-210 Greenspot Road Off-ramp	Diverge	3MF/ 1L Ramp	28.6	D	34.6	D
SR-210 Greenspot Road On-ramp	Merge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between 5th Street-Greenspot Road and Base Line	Weave	3MF/ 1 Aux	17.5	B	23.0	C
SR-210 Base Line Off-ramp	Diverge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between Base Line and SR-330	Weave	3MF/ 1 Aux	18.5	B	20.6	C
SR-210 SR-330 Connector	Merge	3MF/ 1L Ramp	24.4	C	25.3	C
SR-210 between SR-330 and Highland Avenue-Arden Avenue	Freeway	3MF	23.0	C	24.4	C
SR-210 Highland Avenue Off-ramp	Diverge	3MF/ 1L Ramp	28.7	D	29.8	D

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

6.0 HORIZON YEAR (2040) TRAFFIC CONDITIONS

The purpose of this chapter is to present and document the forecast future traffic conditions on the anticipated Horizon Year (2040) of the proposed project. Future year traffic volumes were developed for the Horizon Year (2040) No Build and Build conditions.

As part of the Horizon Year (2040) conditions, the proposed SR-210/Victoria Avenue Interchange could be potentially in-place by year 2040. However, since the proposed Victoria Avenue Interchange is currently under study and refinement, analysis of the interchange is not included due to the lack of finalized geometric configuration assumptions for the interchange itself and the adjacent interchange ramp systems. A Project Study Report/Project Development Support (PSR/PDS) for the SR-210/Victoria Avenue Interchange was approved by Caltrans on April 8, 2011 to evaluate the feasibility of constructing a new interchange within the city limits of Highland and San Bernardino on SR-210 at Victoria Avenue. The purpose of the new interchange would be to improve access to business and entertainment facilities in the Victoria Avenue corridor, such as the San Bernardino International Airport (SBIA) and the San Manuel Band of Mission Indians establishments.

Consistent with the previous analysis scenario assumptions, Horizon Year (2040) mainline and ramp traffic count data were developed using annualized growth factors described previously in Chapter 2 of this report. During Horizon Year (2040) traffic conditions, volume proportion/flow conservation had been maintained in the development of future mainline traffic volume. The truck percentage value for mainline were similarly assumed for ramp traffic and was used in the weaving, merge and diverge analysis. The PCE factor of 1.5 had been similarly maintained for use in the Horizon Year (2040) traffic operations analysis.

The following analysis provides the evaluation of 2040 No Build and Build project conditions.

Horizon Year (2040) - No Build Traffic Conditions

Figure 8 illustrates Horizon Year (2040) – No Build Freeway Mainline and Ramp Geometric configurations. **Figure 9** illustrates Horizon Year (2040) – No Build Freeway Mainline and Ramp ADT and peak hour traffic volumes.

An operational analysis was conducted for the SR-210 mainline, ramp merge and diverge areas within the project study area and the results are summarized in **Table 10** for the eastbound SR-210 direction and in **Table 11** for the westbound SR-210 direction.

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Figure 8
Horizon Year (2040) No Build Freeway Mainline and Ramp Geometrics

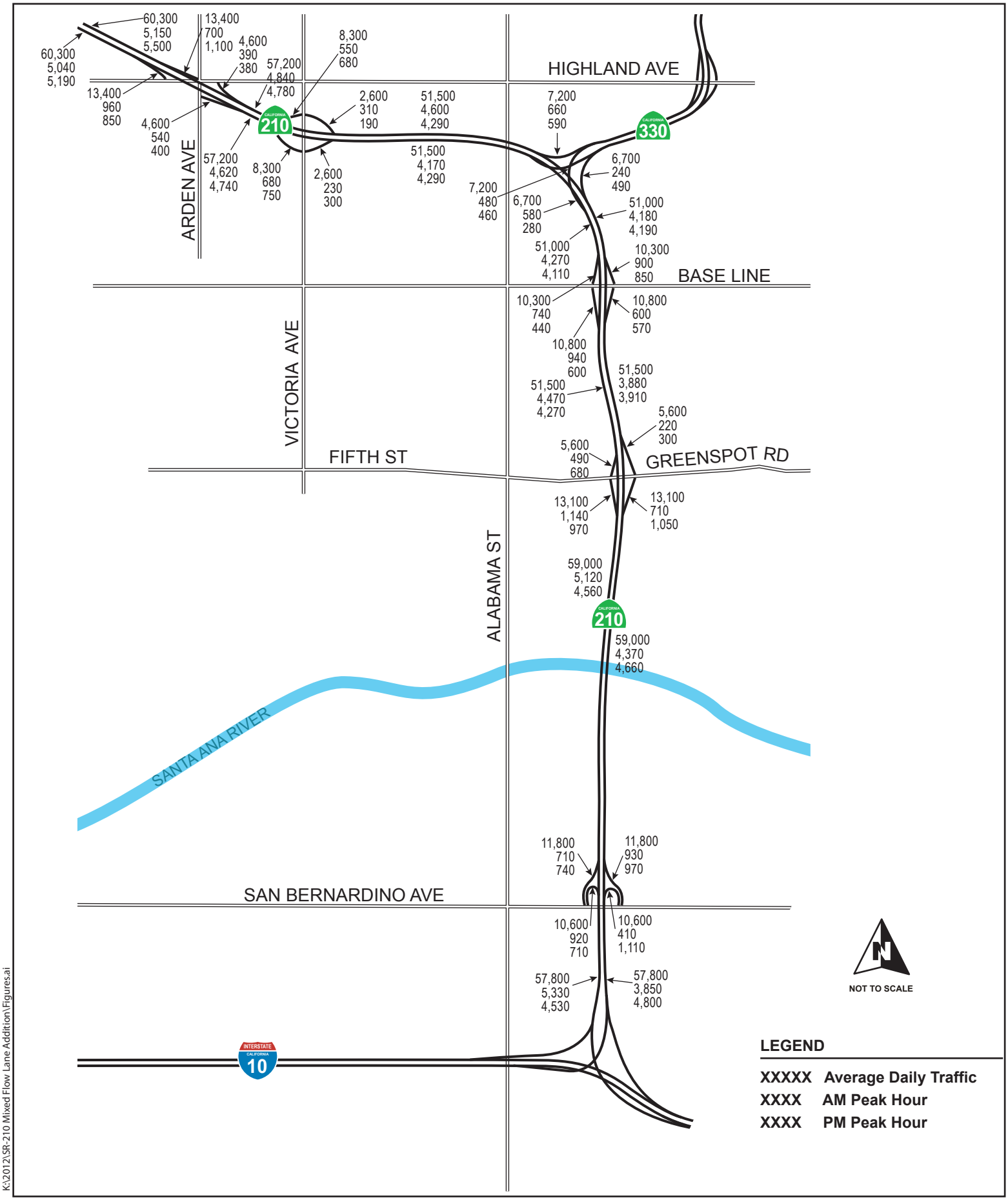

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Figure 9
Horizon Year (2040) No Build Freeway Mainline and Ramp Volumes

Table 10:
Horizon Year (2040) SR-210 – No Build Eastbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Horizon Year (2040)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between Sterling Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	29.8	D	30.6	D
SR-210 Highland Avenue Off-ramp	Trap Lane	2MF/ 1L Trap	N/A[3]	N/A[3]	N/A[3]	N/A[3]
SR-210 Arden Avenue On-ramp	Merge	2MF/ 1L Ramp	--*	**F**	--*	**F**
SR-210 between Highland Avenue-Arden Avenue and Victoria Avenue	Freeway	2MF	54.7	**F**	57.1	**F**
SR-210 between Victoria Avenue and SR-330	Freeway	2MF	42.8	**E**	44.5	**E**
SR-210 SR-330 Connector	Diverge	2MF/ 1L Decel	33.1	D	33.8	D
SR-210 between SR-330 and Base Line	Weave	2MF/ 1 Aux	29.0	D	26.6	C
SR-210 Base Line On-ramp	Merge	2MF/ 1L Ramp	--*	**F**	37.5	**E**
SR-210 between Base Line and 5th Street-Greenspot Road	Freeway	2MF	49.6	**F**	43.6	**E**
SR-210 5th Street Off-ramp	Diverge	2MF/ 1L Ramp	--*	**F**	36.5	**E**
SR-210 5th Street On-ramp	Merge	2MF/ 1L Ramp	--*	**F**	--*	**F**
SR-210 between 5th Street-Greenspot Road and San Bernardino Avenue	Freeway	2MF	75.8	**F**	50.8	**F**
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	33.9	D	31.2	D
SR-210 San Bernardino Avenue On-ramp	Merge	4MF/ 1L Ramp	24.2	C	20.3	C
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	22.5	C	18.9	C

Notes: --* = Demand exceeds capacity.

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

Table 11:
Horizon Year (2040) SR-210 – No Build Westbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Horizon Year (2040)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	21.6	C	27.4	D
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	27.4	C	33.1	D
SR-210 San Bernardino Avenue On-ramp	Merge	2MF/ 1L Ramp	--*	**F**	--*	**F**
SR-210 between San Bernardino Avenue and 5th Street-Greenspot Road	Freeway	2MF	47.0	**F**	53.7	**F**
SR-210 Greenspot Road Off-ramp	Diverge	2MF/ 1L Ramp	--*	**F**	--*	**F**
SR-210 Greenspot Road On-ramp	Merge	2MF/ 1L Ramp	34.8	D	34.6	D
SR-210 between 5th Street-Greenspot Road and Base Line	Freeway	2MF	36.9	**E**	36.8	**E**
SR-210 Base Line Off-ramp	Diverge	2MF/ 1L Ramp	33.2	D	33.1	D
SR-210 between Base Line and SR-330	Weave	2MF/ 1 Aux	29.6	D	28.9	D
SR-210 SR-330 Connector	Merge	2MF/ 1L Ramp	--*	**F**	37.9	**E**
SR-210 between SR-330 and Victoria Avenue	Freeway	2MF	54.1	**F**	44.5	**E**
SR-210 between Victoria Avenue and Highland Avenue-Arden Avenue	Freeway	2MF	63.0	**F**	58.6	**F**
SR-210 Highland Avenue Off-ramp	Diverge	2MF/ 1L Ramp	--*	**F**	--*	**F**

Notes: --* = Demand exceeds capacity.

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

Horizon Year (2040) - Build Traffic Conditions

Figure 10 illustrates Horizon Year (2040) – Build Freeway Mainline and Ramp Geometric configurations. **Figure 11** illustrates Horizon Year (2040) – Build Freeway Mainline and Ramp ADT and peak hour traffic volumes.

Similar to Horizon Year (2040) – No Build conditions, an operational analysis was conducted for Build Conditions of the SR-210 mainline, ramp merge and diverge areas within the project study area and the results are summarized in **Table 12** for the eastbound SR-210 direction and in **Table 13** for the westbound SR-210 direction.

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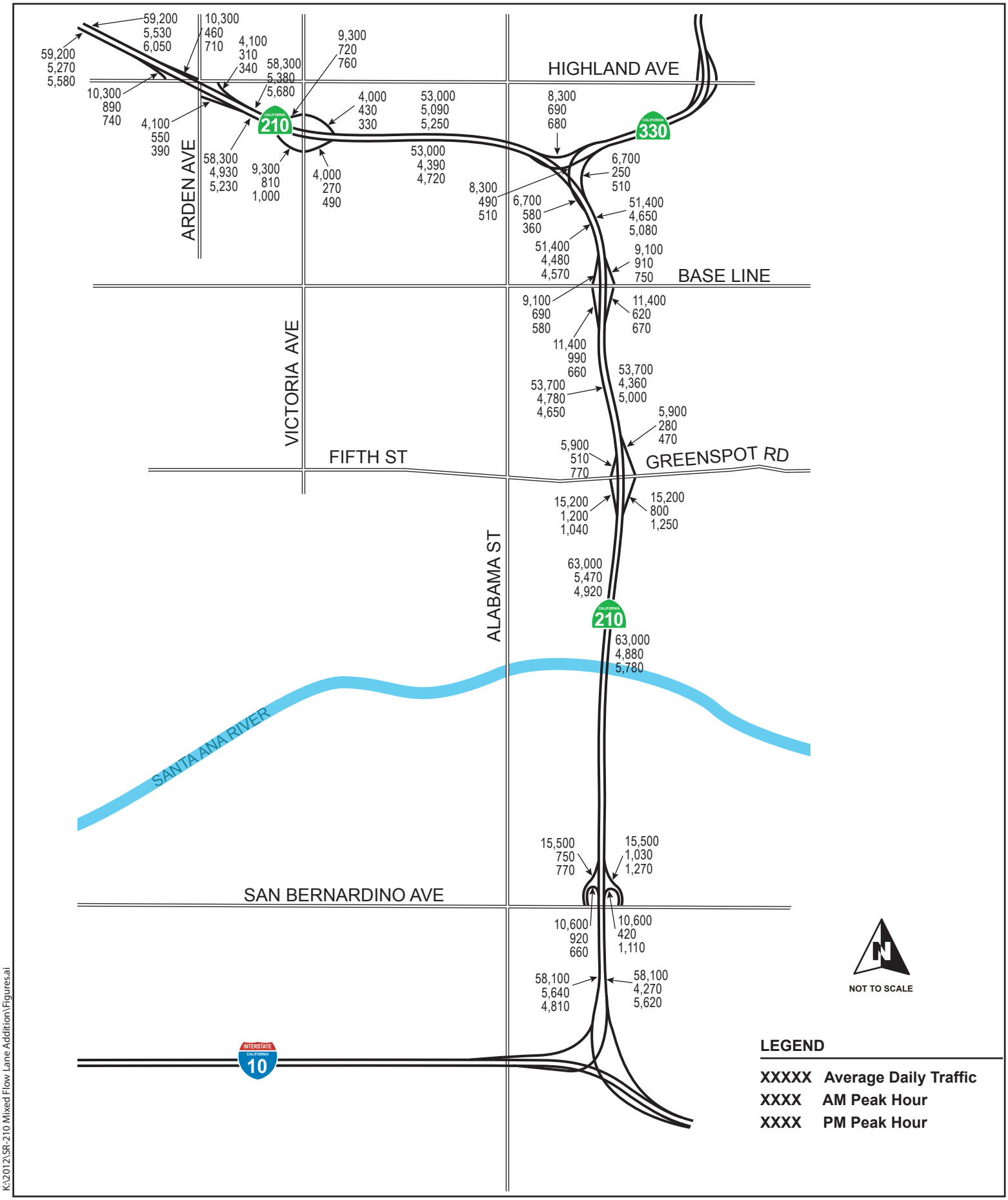
Figure 10
Horizon Year (2040) Build Freeway Mainline and Ramp Geometrics



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SR-210 Mixed Flow Lane Addition (PM R26.0/R33.2) - EA 0C700

Figure 11
Horizon Year (2040) Build Freeway Mainline and Ramp Volumes

Table 12:
Horizon Year (2040) SR-210 – Build Eastbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Horizon Year (2040)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between Sterling Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	31.7	D	34.1	D
SR-210 Highland Avenue Off-ramp	Diverge	3MF/ 2L Ramp	25.6	C	26.9	C
SR-210 Arden Avenue On-ramp	Merge	3MF/ 1L Ramp	28.5	D	29.3	D
SR-210 between Highland Avenue-Arden Avenue and Victoria Avenue	Freeway	3MF	28.9	D	30.9	D
SR-210 between Victoria Avenue and SR-330	Freeway	3MF	25.0	C	27.0	D
SR-210 SR-330 Connector	Diverge	3MF/ 1L Decel	21.0	C	22.3	C
SR-210 between SR-330 and Base Line	Weave	3MF/ 1 Aux	22.3	C	22.0	C
SR-210 Base Line On-ramp	Merge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between Base Line and 5th Street-Greenspot Road	Weave	3MF/ 1 Aux	26.8	C	25.5	C
SR-210 5th Street Off-ramp	Diverge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 5th Street On-ramp	Merge	3MF/ 1L Accel	33.1	D	29.5	D
SR-210 between 5th Street-Greenspot Road and San Bernardino Avenue	Freeway	3MF	33.3	D	28.2	D
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	35.5	**E**	32.9	D
SR-210 San Bernardino Avenue On-ramp	Merge	4MF/ 1L Ramp	25.2	C	21.0	C
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	23.9	C	20.1	C

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

Table 13:
Horizon Year (2040) SR-210 – Build Westbound Mainline and Ramp Operations LOS

Freeway Mainline Segment / Ramp Connection	Freeway Mainline / Ramp Connection Merge/Diverge Analyses Horizon Year (2040)					
	Facility	Lanes	AM Peak		PM Peak	
			Den.	LOS	Den.	LOS
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	24.1	C	34.2	D
SR-210 San Bernardino Avenue Off-ramp	Diverge	3MF/ 1L Ramp	29.5	D	36.6	**E**
SR-210 San Bernardino Avenue On-ramp	Merge	3MF/ 1L Ramp	29.6	D	34.1	D
SR-210 between San Bernardino Avenue and 5th Street-Greenspot Road	Freeway	3MF	28.3	D	35.8	**E**
SR-210 Greenspot Road Off-ramp	Diverge	3MF/ 1L Ramp	33.0	D	37.5	**E**
SR-210 Greenspot Road On-ramp	Merge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between 5th Street-Greenspot Road and Base Line	Weave	3MF/ 1 Aux	22.7	C	26.8	C
SR-210 Base Line Off-ramp	Diverge	3MF/ 1 Aux	N/A[4]	N/A[4]	N/A[4]	N/A[4]
SR-210 between Base Line and SR-330	Weave	3MF/ 1 Aux	24.3	C	25.9	C
SR-210 SR-330 Connector	Merge	3MF/ 1L Ramp	29.9	D	30.3	D
SR-210 between SR-330 and Victoria Avenue	Freeway	3MF	30.2	D	31.1	D
SR-210 between Victoria Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	32.7	D	35.1	**E**
SR-210 Highland Avenue Off-ramp	Diverge	3MF/ 1L Ramp	34.5	D	35.6	**E**

Notes:

1. "Highland Avenue-Arden Avenue" refers to SR-210 off-ramps to Highland Avenue and SR-210 on-ramps from Arden Avenue (EB) and both Arden Avenue/Highland Avenue (WB).
2. "5th Street-Greenspot Road" refers to SR-210 off/on-ramps to 5th Street (EB) and SR-210 off/on-ramps to Greenspot Road (WB).
3. Ramp junction analysis is not applicable for lane drop (trap) lane or lane addition connection to freeway.
4. Ramp junction analysis is not applicable for ramp connections in weave segments.

7.0 SUMMARY AND CONCLUSION

This chapter provides a summary of the results of the operational analyses performed for the proposed project. Existing (2012), Opening Year (2020) and Horizon Year (2040) results are discussed in the following sections.

Existing (2012) Traffic Conditions

The existing mainline SR-210 freeway is generally operating at acceptable levels of service (LOS D or better) based upon 2012 traffic volumes. The areas of heaviest congestion occur between Fifth Street-Greenspot Road and San Bernardino Avenue. One freeway segment is operating at LOS E during the morning peak hour (EB from Fifth Street-Greenspot Road to San Bernardino Avenue) and two ramp junctions are operating at LOS E (EB Fifth Street on-ramp in the morning peak hour and WB Greenspot Road off-ramp in the evening peak hour). The short weaving segment between SR-330 and Base Line is operating at LOS B in both directions during both the morning and evening peak hours. The existing freeway segments approaching the I-10 freeway junction are operating at good levels of service (LOS B and LOS C).

Opening Year (2020) Traffic Conditions

The SR-210 mainline freeway will operate at LOS D or better in all segments and at all ramp junctions under opening year with project conditions. The weaving segment between SR-330 and Base Line will operate acceptably as well (LOS B and LOS C) in 2020 in both directions during morning and evening peak hours. The auxiliary lanes proposed between Base Line and Fifth Street-Greenspot Road will provide this segment of freeway with good levels of service in both directions (LOS B and LOS C) in the opening year. The freeway segments between San Bernardino Avenue and I-10 degrade slightly from existing conditions, but still maintain adequate levels of service of B, C and D in the morning and evening peak hours.

If the proposed project was not constructed by 2020, the operational conditions are anticipated to be generally one level of service worse on each freeway segment and at each freeway ramp junction when compared to the build condition. Several segments are forecast to reach LOS E and LOS F conditions without the proposed improvements, particularly the areas between Fifth Street-Greenspot Road and San Bernardino Avenue.

Horizon Year (2040) Traffic Conditions

In the Horizon Year (2040), nearly all mainline freeway segments on SR-210 within the project limits will operate at LOS D or better after implementation of the proposed project improvements. Only one segment (westbound SR-210 from San Bernardino Avenue to Fifth Street-Greenspot Road) will operate at LOS E in the evening peak hour. In the No Build condition this segment would operate a LOS F in both the morning and evening peak hours. Because the density and level of service of this freeway segment only slightly exceeds the criteria for LOS D, the proposed improvements meet the project's Purpose and Need and implementation of the future HOV lane addition project will improve this segment to an acceptable level. The weaving segments between SR-330 and Base Line and between Base Line and Fifth-Street-Greenspot Road will all operate at LOS C in both directions in both morning and evening peak hour periods. The SR-210 freeway segment approaching the I-10 freeway junction will operate at LOS C in both morning and evening peak periods and the SR-

210 freeway segment leading away from the I-10 freeway will operate at LOS C and LOS D in the morning and evening peak periods, respectively.

In the Horizon Year (2040), the levels of service at most of the ramp junctions are anticipated to be LOS D or better. At the specific ramp junctions where the Horizon Year 2040 levels of service are forecast to be LOS E, the Mixed Flow Lane project will incrementally improve these ramp junctions compared to the No Build condition. Improvements at these ramp junctions are not included in this project because ramp and interchange improvements are beyond the Purpose and Need for the Mixed Flow Lane project. Furthermore, future interchange improvement projects are anticipated to address the specific operational issues at these locations. The projected evening peak hour LOS E conditions at the westbound off-ramp to San Bernardino Avenue will be improved as part of the interchange reconstruction project proposed in the SR-210 PSR/PDS approved in 2008. Similarly, the Greenspot Road westbound off-ramp diverge LOS E in the evening peak hour will be addressed as part of the SR-210/Fifth Street-Greenspot Road interchange improvement project under development by the City of Highland. At each of these off-ramps, the addition of a deceleration lane in advance of the off-ramp divergence point should improve the ramp junction level of service to acceptable levels.

Finally, the only other location of LOS E predicted in the Horizon Year 2040 within the project limits is the westbound off-ramp to Highland Avenue and the approaching freeway segment. Studies are currently underway for improvements at this existing interchange, which involve development of a new interchange at Victoria Avenue. While the specific improvements in this location within the SR-210 corridor are not known, it is reasonable to expect that the future year level of service issues at the westbound Highland Avenue off-ramp will be addressed by the proposed improvements considered in conjunction with the SR-210/Victoria Avenue interchange project.

The Horizon Year (2040) No Build versus Build operational results clearly demonstrates the traffic enhancement value of the proposed project improvements. Many freeway mainline segments will operate at LOS E and LOS F without the addition of the third mixed flow lane in each direction. The level of service between Base Line and Fifth Street-Greenspot Road will degrade to LOS E and LOS F by 2040 if the auxiliary lanes between these two interchanges are not constructed. The addition of the eastbound acceleration lane at the Fifth Street on-ramp improves the level of service from LOS F in both the morning and evening peak hour periods to LOS D in both peak periods under Horizon Year (2040) traffic conditions.

Conclusions

The SR-210 Mixed Flow Lane Addition project will address traffic operational issues within this segment of the corridor in both the Opening Year (2020) and Horizon Year (2040) conditions consistent with the project's Purpose and Need. The proposed improvements will maintain levels of service of LOS D or better on all mainline freeway segments, all weave segments and at all ramp junctions.

The only exceptions occur in locations where planned future interchange improvement projects would necessarily address the ramp junction diverge operations. All of the interchange on-ramps, including the freeway-to-freeway connectors at the SR-330 junction, are expected to operate at LOS D or better under future year traffic conditions. Therefore, ramp metering systems not already included in the proposed project improvements, should not be necessary to mitigate ramp junction merge levels of service.

Finally, the level of service of the freeway segment approaching the I-10 freeway junction is LOS C in both peak periods; therefore, the proposed improvements do not have a negative impact on the I-10 freeway interchange. Similarly, the project does not have any detrimental impacts on the westbound segment of the SR-210 freeway departing from the I-10 freeway junction and the level of service in this area is forecasted to remain at LOS D or better through 2040 without any additional improvements.

The proposed mixed flow lane addition in each direction will not preclude other future operational improvement projects that are planned within this corridor. In fact, the addition of the third mixed flow lane will complement the future SR-210 HOV lane addition project and the development of interchange improvement projects throughout the project study limits.

The proposed improvements meet the project's Purpose and Need and improve future operational conditions in comparison with No Build conditions. It is anticipated that after the implementation of the proposed project and with the future addition of the HOV lane project, mainline and ramp merge/diverge operating conditions will further improve in conjunction with other planned interchange improvements within the project study area.

Appendix A – Traffic Model Projections

SR-210 Mixed Flow Lane Addition
Peak Hour Freeway Volume Summary

Eastbound/Southbound

Freeway Mainline Segment / Ramp Connection	Facility	Lanes	Existing to No Build Annual Growth [1]		2012		2020				2040			
					Existing		No Build		Build		No Build		Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Highland Ave	Diverge	3MF/ 1L Ramp	4	2	864	786	1,090	1,020	1,150	1,160	960	850	890	740
Highland Ave	Merge	3MF/ 1L Ramp	-2	-3	598	488	640	550	690	730	540	400	550	390
SR-210 between Arden Avenue and Victoria Ave	Freeway	3MF	66	62	2,760	3,007	3,150	3,370	3,370	3,800	4,620	4,740	4,930	5,230
SR-210 between Victoria Ave and SR-330	Freeway	3MF	50	46	2,760	3,007	3,150	3,370	3,370	3,800	4,170	4,290	4,390	4,720
SR-210 to SR-330 Connector	Diverge	3MF/ 1L Ramp	4	6	361	287	400	340	410	390	480	460	490	510
SR-210 between SR-330 and Base Line	Weave	4MF	53	37	2,779	2,948	3,190	3,270	3,400	3,730	4,270	4,110	4,480	4,570
Sr-210 between Base Line and 5th Street	Weave	4MF	4	2	819	554	850	570	900	630	940	600	990	660
SR-210 5th Street On-Ramp	Merge	3MF/ 1L Ramp	4	5	1,032	820	1,060	860	1,120	930	1,140	970	1,200	1,040
SR-210 between 5th Street and San Bernardino Avenue	Freeway	3MF	39	28	4,003	3,594	4,300	3,860	4,650	4,220	5,120	4,560	5,470	4,920
SR-210 San Bernardino Avenue Off-Ramp	Diverge	3MF/ 1L Ramp	5	5	568	614	610	650	650	680	710	740	750	770
SR-210 San Bernardino Avenue On-Ramp	Merge	4MF/ 1L Ramp	12	9	590	466	680	530	680	480	920	710	920	660
SR-210 between San Bernardino Avenue and I-10 Freeway	Freeway	4MF	34	28	4,025	3,446	4,370	3,740	4,680	4,020	5,330	4,530	5,640	4,810

(1) Existing to No Build (2040) Annual Growth = [No Build (2040) - Existing (2012)] ÷ (2040 - 2012). Equation provided to illustrate general linear annual growth trends.

SR-210 Mixed Flow Lane Addition
Peak Hour Freeway Volume Summary

Westbound/Northbound

Freeway Mainline Segment / Ramp Connection	Facility	Lanes	Existing to No Build Annual Growth [1]		2012		2020				2040			
					Existing		No Build		Build		No Build		Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
SR-210 between I-10 Freeway and San Bernardino Avenue	Freeway	3MF	42	37	2,663	3,774	3,000	4,070	3,420	4,890	3,850	4,800	4,270	5,620
SR-210 San Bernardino Avenue Off-Ramp	Diverge	3MF/ 1L Ramp	8	12	194	778	260	870	270	870	410	1,110	420	1,110
SR-210 San Bernardino Avenue On-Ramp	Merge	3MF/ 1L Ramp	11	9	615	720	700	790	800	1,090	930	970	1,030	1,270
SR-210 between San Bernardino Avenue and Greenspot Road	Freeway	3MF	46	34	3,083	3,716	3,440	3,990	3,950	5,110	4,370	4,660	4,880	5,780
SR-210 Greenspot Road Off-Ramp	Diverge	3MF/ 1L Ramp	2	4	652	944	670	970	760	1,170	710	1,050	800	1,250
SR-210 between Greenspot Road and Base Line	Weave	4MF	44	35	2,640	3,038	2,980	3,300	3,460	4,390	3,880	3,910	4,360	5,000
SR-210 between Base Line and SR-330	Weave	4MF	48	48	2,823	2,996	3,200	3,360	3,670	4,250	4,180	4,190	4,650	5,080
SR-210 SR-330 Connector	Merge	3MF/ 1L Ramp	4	7	544	398	580	450	610	540	660	590	690	680
SR-210 between SR-330 and Victoria Avenue	Freeway	3MF	51	51	3,176	2,985	3,580	3,380	4,070	4,340	4,600	4,290	5,090	5,250
SR-210 between Victoria Avenue and Highland Avenue-Arden Avenue	Freeway	3MF	59	69	3,176	2,985	3,580	3,380	4,070	4,340	4,840	4,780	5,380	5,680
SR-210 Highland Avenue Off-Ramp	Diverge	3MF/ 1L Ramp	-2	3	449	282	520	360	560	460	390	380	310	340
SR-210 Highland Avenue On-Ramp	Merge	3MF/ 1L Ramp	3	15	633	691	810	1,000	740	690	700	1,100	460	710

(1) Existing to No Build (2040) Annual Growth = [No Build (2040) - Existing (2012)] ÷ (2040 - 2012). Equation provided to illustrate general linear annual growth trends.

Appendix B – Traffic Analysis Worksheets

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3026*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1111*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*17.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3305*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1200*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*18.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 3810 ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = 864 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2162	
	Ramp Volume, V_R: 598	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2162	0.94	Level	7	0	0.966	1.00	2380
Ramp	598	0.94	Level	7	0	0.966	1.00	658
UpStream	864	0.94	Level	7	0	0.966	1.00	951
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2380 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3038	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3038	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.342 (Exibit 13-11)

S_R= 57.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 57.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = 3810 ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = 488 veh/h
	Freeway Volume, V_F: 2519	
	Ramp Volume, V_R: 488	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2519	0.95	Level	7	0	0.966	1.00	2744
Ramp	488	0.95	Level	7	0	0.966	1.00	532
UpStream								
DownStream	488	0.95	Level	7	0	0.966	1.00	532

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2744 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3276	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3276	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.364 (Exibit 13-11)

S_R= 56.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2760*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1519*	pc/h/ln
S	*64.8*	mph
D = v_p / S	*23.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3007*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1638*	pc/h/ln
S	*64.2*	mph
D = v_p / S	*25.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	1180	L_{down} =	3260 ft
V_u =	veh/h	Freeway Volume, V_F	2760	V_D =	380 veh/h
		Ramp Volume, V_R	361		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2760	0.94	Level	7	0	0.966	1.00	3039
Ramp	361	0.94	Level	15	0	0.930	1.00	413
UpStream								
DownStream	380	0.94	Level	6	0	0.971	1.00	416

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3039 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3039	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2626	Exhibit 13-8	4700	No
V_R	413	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3039	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 19.8 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.270 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	3007
Ramp Volume, V_R	287
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 3260 ft

V_D = 228 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3007	0.95	Level	7	0	0.966	1.00	3276
Ramp	287	0.95	Level	15	0	0.930	1.00	325
UpStream								
DownStream	228	0.95	Level	6	0	0.971	1.00	247

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3276 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3276	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2951	Exhibit 13-8	4700	No
V_R	325	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3276	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 21.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.262 (Exhibit 13-12)

S_R= 59.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.0 mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	Existing

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	1065ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2182	0.94	6	0	1.5	1.2	0.971	1.00	2391
V_{RF}	345	0.94	6	0	1.5	1.2	0.971	1.00	378
V_{FR}	217	0.94	6	0	1.5	1.2	0.971	1.00	238
V_{RR}	35	0.94	6	0	1.5	1.2	0.971	1.00	38
V_{NW}	2429							V =	3045
V_W	616								
VR	0.202								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	378 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	526 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	500 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1026 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	181

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3045 pc/h	Weaving intensity factor, W	0.219
Weaving segment capacity, c_w	6414 veh/h	Weaving segment speed, S	57.1 mph
Weaving segment v/c ratio	0.461	Average weaving speed, S_W	56.0 mph
Weaving segment density, D	17.8 pc/mi/ln	Average non-weaving speed, S_{NW}	57.4 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	2994 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	Existing

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	1065ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2398	0.95	6	0	1.5	1.2	0.971	1.00	2600
V_{RF}	203	0.95	6	0	1.5	1.2	0.971	1.00	220
V_{FR}	322	0.95	6	0	1.5	1.2	0.971	1.00	349
V_{RR}	25	0.95	6	0	1.5	1.2	0.971	1.00	27
V_{NW}	2627							V =	3196
V_W	569								
VR	0.178								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	220 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	368 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	541 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	909 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	196

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3196 pc/h	Weaving intensity factor, W	0.199
Weaving segment capacity, c_w	6469 veh/h	Weaving segment speed, S	58.0 mph
Weaving segment v/c ratio	0.480	Average weaving speed, S_W	56.7 mph
Weaving segment density, D	18.4 pc/mi/ln	Average non-weaving speed, S_{NW}	58.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	2747 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Base Line On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 2120 ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = 252 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2526	
	Ramp Volume, V_R: 819	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2526	0.94	Level	6	0	0.971	1.00	2768
Ramp	819	0.94	Level	6	0	0.971	1.00	897
UpStream	252	0.94	Level	6	0	0.971	1.00	276
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2768 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3665	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3665	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.413 (Exibit 13-11)

S_R= 55.5 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Base Line On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 2120 ft

V_u = 347 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	600
Deceleration Lane Length L_D	
Freeway Volume, V_F	2601
Ramp Volume, V_R	554
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2601	0.95	Level	6	0	0.971	1.00	2820
Ramp	554	0.95	Level	6	0	0.971	1.00	601
UpStream	347	0.95	Level	6	0	0.971	1.00	376
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2820 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3421	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3421	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.380 (Exibit 13-11)

S_R= 56.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3346*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1833*	pc/h/ln
S	*62.3*	mph
D = v_p / S	*29.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3155*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1710*	pc/h/ln
S	*63.6*	mph
D = v_p / S	*26.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	L_{down} = 2210 ft
V_u = veh/h	Deceleration Lane Length L_D: 840	V_D = 1032 veh/h
	Freeway Volume, V_F: 3346	
	Ramp Volume, V_R: 375	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3346	0.94	Level	6	0	0.971	1.00	3666
Ramp	375	0.94	Level	6	0	0.971	1.00	411
UpStream								
DownStream	1032	0.94	Level	6	0	0.971	1.00	1131

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3666 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3666	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3255	Exhibit 13-8	4700	No
V_R	411	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3666	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 28.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.270 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	840	L_{down} =	2210 ft
V_u =	veh/h	Freeway Volume, V_F	3155	V_D =	820 veh/h
		Ramp Volume, V_R	381		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3155	0.95	Level	6	0	0.971	1.00	3421
Ramp	381	0.95	Level	6	0	0.971	1.00	413
UpStream								
DownStream	820	0.95	Level	6	0	0.971	1.00	889

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3421 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3421	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3008	Exhibit 13-8	4700	No
V_R	413	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3421	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 26.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.270 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 2210 ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = 375 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2971	
	Ramp Volume, V_R: 1032	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2971	0.94	Level	6	0	0.971	1.00	3255
Ramp	1032	0.94	Level	6	0	0.971	1.00	1131
UpStream	375	0.94	Level	6	0	0.971	1.00	411
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3255 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4386	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4386	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 35.4 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.574 (Exibit 13-11)

S_R= 51.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = 2210 ft	Acceleration Lane Length, L_A	600	L_{down} = ft
V_u = 820 veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	2774	
	Ramp Volume, V_R	820	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2774	0.95	Level	6	0	0.971	1.00	3008
Ramp	820	0.95	Level	6	0	0.971	1.00	889
UpStream	820	0.95	Level	6	0	0.971	1.00	889
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3008 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3897	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3897	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 31.7 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.453 (Exibit 13-11)

S_R= 54.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 54.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4003*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2193*	pc/h/ln
S	*56.1*	mph
D = v_p / S	*39.1*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3594*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1948*	pc/h/ln	Design LOS	
S	*60.7*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
D = v_p / S	*32.1*	pc/mi/ln	S	mph
LOS	*D*		D = v_p / S	pc/mi/ln
			Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	4003
Ramp Volume, V_R	568
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 590 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4003	0.94	Level	6	0	0.971	1.00	4386
Ramp	568	0.94	Level	6	0	0.971	1.00	622
UpStream								
DownStream	590	0.94	Level	6	0	0.971	1.00	646

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.622 using Equation (Exhibit 13-7)

V_{12} = 2962 pc/h

V_3 or V_{av34} 1424 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4386	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3764	Exhibit 13-8	7050	No
V_R	622	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2962	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 28.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.289 (Exhibit 13-12)

S_R= 58.4 mph (Exhibit 13-12)

S_0= 69.7 mph (Exhibit 13-12)

S = 61.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3594
Ramp Volume, V_R	614
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 466 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3594	0.95	Level	6	0	0.971	1.00	3897
Ramp	614	0.95	Level	6	0	0.971	1.00	666
UpStream								
DownStream	466	0.95	Level	6	0	0.971	1.00	505

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.632 using Equation (Exhibit 13-7)

V_{12} = 2708 pc/h

V_3 or V_{av34} 1189 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3897	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3231	Exhibit 13-8	7050	No
V_R	666	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2708	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 26.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.293 (Exhibit 13-12)

S_R= 58.3 mph (Exhibit 13-12)

S_0= 70.6 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1265 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	568 veh/h	Freeway Volume, V_F	3435	V_D = veh/h
		Ramp Volume, V_R	590	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3435	0.94	Level	6	0	0.971	1.00	3764
Ramp	590	0.94	Level	6	0	0.971	1.00	646
UpStream	568	0.94	Level	6	0	0.971	1.00	622
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.137 using Equation (Exhibit 13-6)

V_{12} = 516 pc/h

V_3 or V_{av34} 1624 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☑ Yes ☐ No

If Yes, V_{12a} = 1505 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4410	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2151	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 18.2 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.295 (Exibit 13-11)

S_R= 58.2 mph (Exhibit 13-11)

S_0= 62.7 mph (Exhibit 13-11)

S = 60.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1265 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	614 veh/h	Freeway Volume, V_F	2980	V_D = veh/h
		Ramp Volume, V_R	466	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2980	0.95	Level	6	0	0.971	1.00	3231
Ramp	466	0.95	Level	6	0	0.971	1.00	505
UpStream	614	0.95	Level	6	0	0.971	1.00	666
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.288 using Equation (Exhibit 13-6)

V_{12} = 932 pc/h

V_3 or V_{av34} 1149 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☑ Yes ☐ No

If Yes, V_{12a} = 1292 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3736	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1797	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 15.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.285 (Exibit 13-11)

S_R= 58.5 mph (Exhibit 13-11)

S_0= 63.3 mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4025*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1103*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*17.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3446*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*934*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*14.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3179
Ramp Volume, V_R	449
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 2745 ft

V_D = 633 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3179	0.94	Level	7	0	0.966	1.00	3500
Ramp	449	0.94	Level	7	0	0.966	1.00	494
UpStream								
DownStream	633	0.94	Level	15	0	0.930	1.00	724

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3500 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3500	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3006	Exhibit 13-8	4700	No
V_R	494	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3500	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.277 (Exhibit 13-12)

S_R= 58.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	141	V_D = veh/h
	Freeway Volume, V_F	2985	
	Ramp Volume, V_R	282	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2985	0.95	Level	7	0	0.966	1.00	3252
Ramp	282	0.95	Level	7	0	0.966	1.00	307
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3252 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3252	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2945	Exhibit 13-8	4700	No
V_R	307	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3252	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 31.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.261 (Exhibit 13-12)

S_R= 59.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.0 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3176*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1748*	pc/h/ln
S	*63.3*	mph
D = v_p / S	*27.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2985*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1626*	pc/h/ln
S	*64.3*	mph
D = v_p / S	*25.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2632	
	Ramp Volume, V_R: 544	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2632	0.94	Level	7	0	0.966	1.00	2898
Ramp	544	0.94	Level	15	0	0.930	1.00	622
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2898 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3520	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3520	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.393 (Exibit 13-11)

S_R= 56.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2587	
	Ramp Volume, V_R: 398	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2587	0.95	Level	7	0	0.966	1.00	2818
Ramp	398	0.95	Level	15	0	0.930	1.00	450
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2818 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3268	Exhibit 13-8		No

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3268	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.363 (Exibit 13-11)

S_R= 56.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.6 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	Existing

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	1948	0.94	6	0	1.5	1.2	0.971	1.00	2135
V_{RF}	685	0.94	6	0	1.5	1.2	0.971	1.00	751
V_{FR}	141	0.94	6	0	1.5	1.2	0.971	1.00	155
V_{RR}	50	0.94	6	0	1.5	1.2	0.971	1.00	55
V_{NW}	2190							V =	3096
V_W	906								
VR	0.293								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	751 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	926 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	610 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1536 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	208

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3096 pc/h	Weaving intensity factor, W	0.249
Weaving segment capacity, c_w	6271 veh/h	Weaving segment speed, S	54.8 mph
Weaving segment v/c ratio	0.479	Average weaving speed, S_W	55.0 mph
Weaving segment density, D	18.8 pc/mi/ln	Average non-weaving speed, S_{NW}	54.6 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3939 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	Existing

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	1360ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2172	0.95	6	0	1.5	1.2	0.971	1.00	2355
V_{RF}	415	0.95	6	0	1.5	1.2	0.971	1.00	450
V_{FR}	344	0.95	6	0	1.5	1.2	0.971	1.00	373
V_{RR}	65	0.95	6	0	1.5	1.2	0.971	1.00	70
V_{NW}	2425							V =	3248
V_W	823								
VR	0.253								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	450 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	625 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	659 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1284 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	231

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3248 pc/h	Weaving intensity factor, W	0.216
Weaving segment capacity, c_w	6364 veh/h	Weaving segment speed, S	56.5 mph
Weaving segment v/c ratio	0.496	Average weaving speed, S_W	56.1 mph
Weaving segment density, D	19.2 pc/mi/ln	Average non-weaving speed, S_{NW}	56.6 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3523 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	850	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	2640	V_D =	veh/h
		Ramp Volume, V_R	552		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2640	0.94	Level	6	0	0.971	1.00	2893
Ramp	552	0.94	Level	6	0	0.971	1.00	605
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2893 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2893	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2288	Exhibit 13-8	4700	No
V_R	605	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2893	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 21.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.287 (Exhibit 13-12)

S_R= 58.4 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	850	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3038	V_D =	veh/h
		Ramp Volume, V_R	522		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3038	0.95	Level	6	0	0.971	1.00	3294
Ramp	522	0.95	Level	6	0	0.971	1.00	566
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3294 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3294	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2728	Exhibit 13-8	4700	No
V_R	566	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3294	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 24.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.284 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.5 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2640*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1446*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*22.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Greenspot On / Base Line Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3038*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1647*	pc/h/ln
S	*64.1*	mph
D = v_p / S	*25.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2431	
	Ramp Volume, V_R: 209	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2431	0.94	Level	6	0	0.971	1.00	2664
Ramp	209	0.94	Level	6	0	0.971	1.00	229
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2664 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2893	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2893	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.331 (Exibit 13-11)

S_R= 57.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 57.4 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2772	
	Ramp Volume, V_R: 266	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2772	0.95	Level	6	0	0.971	1.00	3005
Ramp	266	0.95	Level	6	0	0.971	1.00	288
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3005 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3293	Exhibit 13-8		No

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3293	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.366 (Exibit 13-11)

S_R= 56.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.6 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3083	V_D =	veh/h
		Ramp Volume, V_R	652		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3083	0.94	Level	6	0	0.971	1.00	3378
Ramp	652	0.94	Level	6	0	0.971	1.00	714
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3378 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3378	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2664	Exhibit 13-8	4700	No
V_R	714	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3378	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 32.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.297 (Exhibit 13-12)

S_R= 58.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3716
Ramp Volume, V_R	944
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 2090 ft

V_D = 266 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3716	0.95	Level	6	0	0.971	1.00	4029
Ramp	944	0.95	Level	6	0	0.971	1.00	1023
UpStream								
DownStream	266	0.95	Level	6	0	0.971	1.00	288

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4029 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4029	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3006	Exhibit 13-8	4700	No
V_R	1023	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4029	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 37.6 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.325 (Exhibit 13-12)

S_R= 57.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.5 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3083*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1689*	pc/h/ln
S	*63.8*	mph
D = v_p / S	*26.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/GreenspotOff*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3716*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2014*	pc/h/ln
S	*59.7*	mph
D = v_p / S	*33.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 1650 ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = 194 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2469	
	Ramp Volume, V_R: 615	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2469	0.94	Level	6	0	0.971	1.00	2705
Ramp	615	0.94	Level	6	0	0.971	1.00	674
UpStream	194	0.94	Level	6	0	0.971	1.00	213
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2705 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3379	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3379	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.375 (Exibit 13-11)

S_R= 56.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.4 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2995	
	Ramp Volume, V_R: 720	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2995	0.95	Level	6	0	0.971	1.00	3247
Ramp	720	0.95	Level	6	0	0.971	1.00	781
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3247 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4028	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4028	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 32.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.480 (Exibit 13-11)

S_R= 54.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 54.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2012

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	2663
Ramp Volume, V_R	194
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1650 ft

V_D = 615 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2663	0.94	Level	6	0	0.971	1.00	2918
Ramp	194	0.94	Level	6	0	0.971	1.00	213
UpStream								
DownStream	615	0.94	Level	6	0	0.971	1.00	674

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.677 using Equation (Exhibit 13-7)

V_{12} = 2045 pc/h

V_3 or V_{av34} 873 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2918	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	2705	Exhibit 13-8	7050	No
V_R	213	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2045	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 20.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.252 (Exhibit 13-12)

S_R= 59.2 mph (Exhibit 13-12)

S_0= 71.3 mph (Exhibit 13-12)

S = 62.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	Existing

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3774
Ramp Volume, V_R	774
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1650 ft

V_D = 720 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3774	0.95	Level	6	0	0.971	1.00	4092
Ramp	774	0.95	Level	6	0	0.971	1.00	839
UpStream								
DownStream	720	0.95	Level	6	0	0.971	1.00	781

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.619 using Equation (Exhibit 13-7)

V_{12} = 2853 pc/h

V_3 or V_{av34} 1239 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4092	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3253	Exhibit 13-8	7050	No
V_R	839	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2853	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 27.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.309 (Exhibit 13-12)

S_R= 57.9 mph (Exhibit 13-12)

S_0= 70.4 mph (Exhibit 13-12)

S = 61.2 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2663*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*973*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*15.0*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*Existing*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3774*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1364*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*21.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3600*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1321*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*20.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3840*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1395*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*21.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2510	
	Ramp Volume, V_R: 640	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2510	0.94	Level	7	0	0.966	1.00	2764
Ramp	640	0.94	Level	7	0	0.966	1.00	705
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2764 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3469	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3469	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.4 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.386 (Exibit 13-11)

S_R= 56.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	10/7/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2820	
	Ramp Volume, V_R: 550	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2820	0.95	Level	7	0	0.966	1.00	3072
Ramp	550	0.95	Level	7	0	0.966	1.00	599
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3072 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3671	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3671	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.414 (Exibit 13-11)

S_R= 55.5 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3150*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1734*	pc/h/ln
S	*63.4*	mph
D = v_p / S	*27.3*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3370*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1836*	pc/h/ln
S	*62.3*	mph
D = v_p / S	*29.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	3150
Ramp Volume, V_R	400
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3150	0.94	Level	7	0	0.966	1.00	3468
Ramp	400	0.94	Level	15	0	0.930	1.00	457
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3468 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3468	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3011	Exhibit 13-8	4700	No
V_R	457	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3468	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 23.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.274 (Exhibit 13-12)

S_R= 58.7 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	3370
Ramp Volume, V_R	340
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3370	0.95	Level	7	0	0.966	1.00	3672
Ramp	340	0.95	Level	15	0	0.930	1.00	385
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3672 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3672	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3287	Exhibit 13-8	4700	No
V_R	385	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3672	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 25.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.268 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2020 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2415	0.94	6	0	1.5	1.2	0.971	1.00	2646
V_{RF}	385	0.94	6	0	1.5	1.2	0.971	1.00	422
V_{FR}	335	0.94	6	0	1.5	1.2	0.971	1.00	367
V_{RR}	55	0.94	6	0	1.5	1.2	0.971	1.00	60
V_{NW}	2706							V =	3495
V_W	789								
VR	0.226								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	422 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	570 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	557 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1127 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	202

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3495 pc/h	Weaving intensity factor, W	0.236
Weaving segment capacity, c_w	6361 veh/h	Weaving segment speed, S	56.2 mph
Weaving segment v/c ratio	0.533	Average weaving speed, S_W	55.4 mph
Weaving segment density, D	20.7 pc/mi/ln	Average non-weaving speed, S_{NW}	56.4 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3235 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2020 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	1065ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2685	0.95	6	0	1.5	1.2	0.971	1.00	2911
V_{RF}	215	0.95	6	0	1.5	1.2	0.971	1.00	233
V_{FR}	345	0.95	6	0	1.5	1.2	0.971	1.00	374
V_{RR}	25	0.95	6	0	1.5	1.2	0.971	1.00	27
V_{NW}	2938							V =	3545
V_W	607								
VR	0.171								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	233 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	381 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	605 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	986 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	219

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3545 pc/h	Weaving intensity factor, W	0.213
Weaving segment capacity, c_w	6486 veh/h	Weaving segment speed, S	57.4 mph
Weaving segment v/c ratio	0.531	Average weaving speed, S_W	56.2 mph
Weaving segment density, D	20.6 pc/mi/ln	Average non-weaving speed, S_{NW}	57.7 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	2678 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Baseline Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2800	
	Ramp Volume, V_R: 850	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2800	0.94	Level	6	0	0.971	1.00	3068
Ramp	850	0.94	Level	6	0	0.971	1.00	931
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3068 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3999	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3999	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 32.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.474 (Exibit 13-11)

S_R= 54.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 54.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Baseline Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2900	
	Ramp Volume, V_R: 570	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2900	0.95	Level	6	0	0.971	1.00	3144
Ramp	570	0.95	Level	6	0	0.971	1.00	618
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3144 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3762	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3762	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.429 (Exibit 13-11)

S_R= 55.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3650*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2000*	pc/h/ln
S	*59.9*	mph
D = v_p / S	*33.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3470*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1881*	pc/h/ln
S	*61.7*	mph
D = v_p / S	*30.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	840	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3650	V_D =	veh/h
		Ramp Volume, V_R	410		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3650	0.94	Level	6	0	0.971	1.00	3999
Ramp	410	0.94	Level	6	0	0.971	1.00	449
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3999 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

	Actual	Capacity		LOS F?
V_F	3999	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3550	Exhibit 13-8	4700	No
V_R	449	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3999	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 31.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.273 (Exhibit 13-12)

S_R= 58.7 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	840	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3470	V_D =	veh/h
		Ramp Volume, V_R	470		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3470	0.95	Level	6	0	0.971	1.00	3762
Ramp	470	0.95	Level	6	0	0.971	1.00	510
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3762 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3762	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3252	Exhibit 13-8	4700	No
V_R	510	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3762	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 29.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.279 (Exhibit 13-12)

S_R= 58.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3240	
	Ramp Volume, V_R: 1060	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3240	0.94	Level	6	0	0.971	1.00	3550
Ramp	1060	0.94	Level	6	0	0.971	1.00	1161
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3550 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4711	Exhibit 13-8		Yes

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4711	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 37.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.695 (Exibit 13-11)

S_R= 49.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 49.0 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3000	
	Ramp Volume, V_R: 860	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3000	0.95	Level	6	0	0.971	1.00	3253
Ramp	860	0.95	Level	6	0	0.971	1.00	932
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3253 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4185	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4185	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 33.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.517 (Exibit 13-11)

S_R= 53.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 53.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4300*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2356*	pc/h/ln
S	*52.0*	mph
D = v_p / S	*45.3*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3860*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2093*	pc/h/ln
S	*58.2*	mph
D = v_p / S	*36.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/7/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	4300
Ramp Volume, V_R	610
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 680 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4300	0.94	Level	6	0	0.971	1.00	4712
Ramp	610	0.94	Level	6	0	0.971	1.00	668
UpStream								
DownStream	680	0.94	Level	6	0	0.971	1.00	745

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.611 using Equation (Exhibit 13-7)

V_{12} = 3141 pc/h

V_3 or V_{av34} 1571 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4712	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4044	Exhibit 13-8	7050	No
V_R	668	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3141	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 30.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.293 (Exhibit 13-12)

S_R= 58.3 mph (Exhibit 13-12)

S_0= 69.1 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/7/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3860
Ramp Volume, V_R	650
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 530 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3860	0.94	Level	6	0	0.971	1.00	4230
Ramp	650	0.94	Level	6	0	0.971	1.00	712
UpStream								
DownStream	530	0.94	Level	6	0	0.971	1.00	581

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.621 using Equation (Exhibit 13-7)

V_{12} = 2898 pc/h

V_3 or V_{av34} 1332 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4230	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3518	Exhibit 13-8	7050	No
V_R	712	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2898	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 27.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.297 (Exhibit 13-12)

S_R= 58.2 mph (Exhibit 13-12)

S_0= 70.0 mph (Exhibit 13-12)

S = 61.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	3690	V_D = veh/h
		Ramp Volume, V_R	680	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3690	0.94	Level	6	0	0.971	1.00	4043
Ramp	680	0.94	Level	6	0	0.971	1.00	745
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.125 using Equation (Exhibit 13-6)

V_{12} = 504 pc/h

V_3 or V_{av34} 1769 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1617 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4788	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2362	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 19.8 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.302 (Exibit 13-11)

S_R= 58.0 mph (Exhibit 13-11)

S_0= 62.4 mph (Exhibit 13-11)

S = 60.2 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	3210	V_D = veh/h
		Ramp Volume, V_R	530	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3210	0.95	Level	6	0	0.971	1.00	3480
Ramp	530	0.95	Level	6	0	0.971	1.00	575
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.280 using Equation (Exhibit 13-6)

V_{12} = 973 pc/h

V_3 or V_{av34} 1253 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1392 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4055	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1967	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 16.8 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.289 (Exibit 13-11)

S_R= 58.4 mph (Exhibit 13-11)

S_0= 63.0 mph (Exhibit 13-11)

S = 60.7 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4370*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1197*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*18.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3740*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*4*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1014*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*15.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3580	V_D =	veh/h
		Ramp Volume, V_R	520		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3580	0.94	Level	7	0	0.966	1.00	3942
Ramp	520	0.94	Level	7	0	0.966	1.00	573
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3942 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3942	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3369	Exhibit 13-8	4700	No
V_R	573	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3942	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 36.9 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.285 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3380	V_D =	veh/h
		Ramp Volume, V_R	360		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3380	0.95	Level	7	0	0.966	1.00	3682
Ramp	360	0.95	Level	7	0	0.966	1.00	392
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3682 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

	Actual	Capacity		LOS F?
V_F	3682	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3290	Exhibit 13-8	4700	No
V_R	392	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3682	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 34.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.268 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3580*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1971*	pc/h/ln
S	*60.4*	mph
D = v_p / S	*32.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3380*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1841*	pc/h/ln
S	*62.2*	mph
D = v_p / S	*29.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3000	
	Ramp Volume, V_R: 580	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3000	0.94	Level	6	0	0.971	1.00	3287
Ramp	580	0.94	Level	15	0	0.930	1.00	663
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3287 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3950	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3950	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 32.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.464 (Exibit 13-11)

S_R= 54.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 54.3 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2930	
	Ramp Volume, V_R: 450	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2930	0.95	Level	6	0	0.971	1.00	3177
Ramp	450	0.95	Level	15	0	0.930	1.00	509
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3177 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3686	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3686	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.417 (Exibit 13-11)

S_R= 55.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.4 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2020 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2270	0.94	6	0	1.5	1.2	0.971	1.00	2487
V_{RF}	730	0.94	6	0	1.5	1.2	0.971	1.00	800
V_{FR}	150	0.94	6	0	1.5	1.2	0.971	1.00	164
V_{RR}	50	0.94	6	0	1.5	1.2	0.971	1.00	55
V_{NW}	2542							V =	3506
V_W	964								
VR	0.275								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	800 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	975 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	683 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1658 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	242

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3506 pc/h	Weaving intensity factor, W	0.264
Weaving segment capacity, c_w	6312 veh/h	Weaving segment speed, S	53.9 mph
Weaving segment v/c ratio	0.539	Average weaving speed, S_W	54.5 mph
Weaving segment density, D	21.7 pc/mi/ln	Average non-weaving speed, S_{NW}	53.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3751 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2020 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2415	0.95	6	0	1.5	1.2	0.971	1.00	2618
V_{RF}	515	0.95	6	0	1.5	1.2	0.971	1.00	558
V_{FR}	355	0.95	6	0	1.5	1.2	0.971	1.00	385
V_{RR}	75	0.95	6	0	1.5	1.2	0.971	1.00	81
V_{NW}	2699							V =	3642
V_W	943								
VR	0.259								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	558 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	733 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	715 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1448 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	257

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3642 pc/h	Weaving intensity factor, W	0.237
Weaving segment capacity, c_w	6350 veh/h	Weaving segment speed, S	55.2 mph
Weaving segment v/c ratio	0.557	Average weaving speed, S_W	55.4 mph
Weaving segment density, D	22.0 pc/mi/ln	Average non-weaving speed, S_{NW}	55.2 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3581 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	850	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	2980	V_D =	veh/h
		Ramp Volume, V_R	560		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2980	0.94	Level	6	0	0.971	1.00	3265
Ramp	560	0.94	Level	6	0	0.971	1.00	614
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3265 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3265	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	2651	Exhibit 13-8	4700	No
V_R	614	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3265	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 24.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.288 (Exhibit 13-12)

S_R= 58.4 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	850	V_D = veh/h
	Freeway Volume, V_F	3300	
	Ramp Volume, V_R	530	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3300	0.95	Level	6	0	0.971	1.00	3578
Ramp	530	0.95	Level	6	0	0.971	1.00	575
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3578 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3578	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3003	Exhibit 13-8	4700	No
V_R	575	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3578	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 27.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.285 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.5 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Greenspot On / Base Line Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2980*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1633*	pc/h/ln
S	*64.2*	mph
D = v_p / S	*25.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Greenspot On / Base Line Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3300*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1789*	pc/h/ln
S	*62.9*	mph
D = v_p / S	*28.5*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2770	
	Ramp Volume, V_R: 210	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2770	0.94	Level	6	0	0.971	1.00	3035
Ramp	210	0.94	Level	6	0	0.971	1.00	230
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3035 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3265	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3265	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.363 (Exibit 13-11)

S_R= 56.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 56.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3020	
	Ramp Volume, V_R: 280	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3020	0.95	Level	6	0	0.971	1.00	3274
Ramp	280	0.95	Level	6	0	0.971	1.00	304
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3274 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3578	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3578	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.401 (Exibit 13-11)

S_R= 55.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3440	V_D =	veh/h
		Ramp Volume, V_R	670		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3440	0.94	Level	6	0	0.971	1.00	3769
Ramp	670	0.94	Level	6	0	0.971	1.00	734
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3769 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

	Actual	Capacity		LOS F?
V_F	3769	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3035	Exhibit 13-8	4700	No
V_R	734	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3769	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 35.4 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.299 (Exhibit 13-12)

S_R= 58.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3990	V_D =	veh/h
		Ramp Volume, V_R	970		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3990	0.95	Level	6	0	0.971	1.00	4326
Ramp	970	0.95	Level	6	0	0.971	1.00	1052
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4326 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4326	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3274	Exhibit 13-8	4700	No
V_R	1052	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4326	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 40.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.328 (Exhibit 13-12)

S_R= 57.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.5 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/GreenspotOff*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3440*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1885*	pc/h/ln	Design LOS		
S	*61.7*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	*30.6*	pc/mi/ln	S		mph
LOS	*D*		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/GreenspotOff*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3990*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2163*	pc/h/ln
S	*56.7*	mph
D = v_p / S	*38.1*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2740	
	Ramp Volume, V_R: 700	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2740	0.94	Level	6	0	0.971	1.00	3002
Ramp	700	0.94	Level	6	0	0.971	1.00	767
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3002 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3769	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3769	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.430 (Exibit 13-11)

S_R= 55.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 55.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3200	
	Ramp Volume, V_R: 790	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3200	0.95	Level	6	0	0.971	1.00	3469
Ramp	790	0.95	Level	6	0	0.971	1.00	857
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3469 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4326	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4326	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 35.1 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.556 (Exibit 13-11)

S_R= 52.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 52.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	3000
Ramp Volume, V_R	260
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1650 ft

V_D = 700 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3000	0.94	Level	6	0	0.971	1.00	3287
Ramp	260	0.94	Level	6	0	0.971	1.00	285
UpStream								
DownStream	700	0.94	Level	6	0	0.971	1.00	767

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.665 using Equation (Exhibit 13-7)

V_{12} = 2280 pc/h

V_3 or V_{av34} 1007 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3287	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3002	Exhibit 13-8	7050	No
V_R	285	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2280	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 22.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.259 (Exhibit 13-12)

S_R= 59.1 mph (Exhibit 13-12)

S_0= 71.3 mph (Exhibit 13-12)

S = 62.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	4070
Ramp Volume, V_R	870
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1650 ft

V_D = 790 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4070	0.95	Level	6	0	0.971	1.00	4413
Ramp	870	0.95	Level	6	0	0.971	1.00	943
UpStream								
DownStream	790	0.95	Level	6	0	0.971	1.00	857

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.606 using Equation (Exhibit 13-7)

V_{12} = 3047 pc/h

V_3 or V_{av34} 1366 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4413	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3470	Exhibit 13-8	7050	No
V_R	943	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3047	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 29.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.318 (Exhibit 13-12)

S_R= 57.7 mph (Exhibit 13-12)

S_0= 69.9 mph (Exhibit 13-12)

S = 61.0 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3000*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1096*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*16.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4070*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1471*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*64.9*	mph	S	mph
D = v_p / S	*22.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3830*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1406*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*21.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4230*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1536*	pc/h/ln
S	*64.7*	mph
D = v_p / S	*23.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Highland Ave Off
Date Performed	7/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	2	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	0	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3830	V_D =	veh/h
		Ramp Volume, V_R	1150		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3830	0.94	Level	7	0	0.966	1.00	4217
Ramp	1150	0.94	Level	7	0	0.966	1.00	1266
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 2594 pc/h

V_3 or V_{av34} 1623 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4217	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	2951	Exhibit 13-8	7050	No
V_R	1266	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2594	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 19.4 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.347 (Exhibit 13-12)

S_R= 57.0 mph (Exhibit 13-12)

S_0= 68.9 mph (Exhibit 13-12)

S = 61.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Highland Ave Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	2	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	0	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	4230	V_D =	veh/h
		Ramp Volume, V_R	1160		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4230	0.95	Level	7	0	0.966	1.00	4608
Ramp	1160	0.95	Level	7	0	0.966	1.00	1264
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 2769 pc/h

V_3 or V_{av34} 1839 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4608	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3344	Exhibit 13-8	7050	No
V_R	1264	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2769	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 20.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.347 (Exhibit 13-12)

S_R= 57.0 mph (Exhibit 13-12)

S_0= 68.0 mph (Exhibit 13-12)

S = 61.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	3810 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	1150 veh/h	Freeway Volume, V_F	2680	V_D = veh/h
		Ramp Volume, V_R	690	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2680	0.94	Level	7	0	0.966	1.00	2951
Ramp	690	0.94	Level	7	0	0.966	1.00	760
UpStream	1150	0.94	Level	7	0	0.966	1.00	1266
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1273.55 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1754 pc/h

V_3 or V_{av34} 1197 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3711	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2514	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 21.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.309 (Exibit 13-11)

S_R= 57.9 mph (Exhibit 13-11)

S_0= 62.5 mph (Exhibit 13-11)

S = 59.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	3810 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	1160 veh/h	Freeway Volume, V_F	3070	V_D = veh/h
		Ramp Volume, V_R	730	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3070	0.95	Level	7	0	0.966	1.00	3345
Ramp	730	0.95	Level	7	0	0.966	1.00	795
UpStream	1160	0.95	Level	7	0	0.966	1.00	1264
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1365.36 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 1988 pc/h

V_3 or V_{av34} 1357 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4140	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2783	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.324 (Exibit 13-11)

S_R= 57.5 mph (Exhibit 13-11)

S_0= 61.9 mph (Exhibit 13-11)

S = 58.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden Ave On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3370*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1237*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*19.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3800*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1380*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*21.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	1180	L_{down} =	3260 ft
V_u =	veh/h	Freeway Volume, V_F	3370	V_D =	440 veh/h
		Ramp Volume, V_R	410		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3370	0.94	Level	7	0	0.966	1.00	3711
Ramp	410	0.94	Level	15	0	0.930	1.00	469
UpStream								
DownStream	440	0.94	Level	6	0	0.971	1.00	482

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.646 using Equation (Exhibit 13-7)

V_{12} = 2562 pc/h

V_3 or V_{av34} 1149 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3711	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3242	Exhibit 13-8	7050	No
V_R	469	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2562	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 15.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.275 (Exhibit 13-12)

S_R= 58.7 mph (Exhibit 13-12)

S_0= 70.7 mph (Exhibit 13-12)

S = 61.9 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 3260 ft

V_u = 320 veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	3800
Ramp Volume, V_R	390
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3800	0.95	Level	7	0	0.966	1.00	4140
Ramp	390	0.95	Level	15	0	0.930	1.00	441
UpStream	320	0.95	Level	6	0	0.971	1.00	347
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = 2614.84 (Equation 13-12 or 13-13)

P_{FD} = 0.636 using Equation (Exhibit 13-7)

V_{12} = 2794 pc/h

V_3 or V_{av34} 1346 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4140	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3699	Exhibit 13-8	7050	No
V_R	441	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2794	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 17.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.273 (Exhibit 13-12)

S_R= 58.7 mph (Exhibit 13-12)

S_0= 70.0 mph (Exhibit 13-12)

S = 62.0 mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2665	0.94	6	0	1.5	1.2	0.971	1.00	2920
V_{RF}	395	0.94	6	0	1.5	1.2	0.971	1.00	433
V_{FR}	295	0.94	6	0	1.5	1.2	0.971	1.00	323
V_{RR}	45	0.94	6	0	1.5	1.2	0.971	1.00	49
V_{NW}	2969							V =	3725
V_W	756								
VR	0.203								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	433 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	697 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	418 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1115 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	221

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3725 pc/h	Weaving intensity factor, W	0.234
Weaving segment capacity, c_w	8551 veh/h	Weaving segment speed, S	57.0 mph
Weaving segment v/c ratio	0.423	Average weaving speed, S_W	55.5 mph
Weaving segment density, D	16.3 pc/mi/ln	Average non-weaving speed, S_{NW}	57.4 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3000 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2945	0.95	6	0	1.5	1.2	0.971	1.00	3193
V_{RF}	275	0.95	6	0	1.5	1.2	0.971	1.00	298
V_{FR}	465	0.95	6	0	1.5	1.2	0.971	1.00	504
V_{RR}	45	0.95	6	0	1.5	1.2	0.971	1.00	49
V_{NW}	3242							V =	4044
V_W	802								
VR	0.198								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	298 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	562 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	475 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1037 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	242

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4044 pc/h	Weaving intensity factor, W	0.221
Weaving segment capacity, c_w	8567 veh/h	Weaving segment speed, S	57.6 mph
Weaving segment v/c ratio	0.458	Average weaving speed, S_W	55.9 mph
Weaving segment density, D	17.6 pc/mi/ln	Average non-weaving speed, S_{NW}	58.0 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	2953 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	Base Line On / 5th Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2500ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2630	0.94	6	0	1.5	1.2	0.971	1.00	2882
V_{RF}	900	0.94	6	0	1.5	1.2	0.971	1.00	986
V_{FR}	430	0.94	6	0	1.5	1.2	0.971	1.00	471
V_{RR}	0	0.94	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	2882							V =	4339
V_W	1457								
VR	0.336								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1457 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1967 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1178 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3145 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	721

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4339 pc/h	Weaving intensity factor, W	0.271
Weaving segment capacity, c_w	6939 veh/h	Weaving segment speed, S	50.9 mph
Weaving segment v/c ratio	0.607	Average weaving speed, S_W	54.3 mph
Weaving segment density, D	21.3 pc/mi/ln	Average non-weaving speed, S_{NW}	49.3 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5971 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	Base Line On / 5th Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	2500ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2660	0.95	6	0	1.5	1.2	0.971	1.00	2884
V_{RF}	630	0.95	6	0	1.5	1.2	0.971	1.00	683
V_{FR}	560	0.95	6	0	1.5	1.2	0.971	1.00	607
V_{RR}	0	0.95	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	2884							V =	4174
V_W	1290								
VR	0.309								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1290 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1800 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1179 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2979 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	721

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4174 pc/h	Weaving intensity factor, W	0.260
Weaving segment capacity, c_w	7539 veh/h	Weaving segment speed, S	51.9 mph
Weaving segment v/c ratio	0.538	Average weaving speed, S_W	54.7 mph
Weaving segment density, D	20.1 pc/mi/ln	Average non-weaving speed, S_{NW}	50.7 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5681 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2210 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	430 veh/h	Freeway Volume, V_F	3530	V_D = veh/h
		Ramp Volume, V_R	1120	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3530	0.94	Level	6	0	0.971	1.00	3868
Ramp	1120	0.94	Level	6	0	0.971	1.00	1227
UpStream	430	0.94	Level	6	0	0.971	1.00	471
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2299 pc/h

V_3 or V_{av34} 1569 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5095	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3526	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.7 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.394 (Exibit 13-11)

S_R= 55.9 mph (Exhibit 13-11)

S_0= 61.2 mph (Exhibit 13-11)

S = 57.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2210 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	560 veh/h	Freeway Volume, V_F	3290	V_D = veh/h
		Ramp Volume, V_R	930	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3290	0.95	Level	6	0	0.971	1.00	3567
Ramp	930	0.95	Level	6	0	0.971	1.00	1008
UpStream	560	0.95	Level	6	0	0.971	1.00	607
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2120 pc/h

V_3 or V_{av34} 1447 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4575	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3128	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.350 (Exibit 13-11)

S_R= 56.9 mph (Exhibit 13-11)

S_0= 61.6 mph (Exhibit 13-11)

S = 58.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*4650*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1698*	pc/h/ln	Design LOS		
S	*63.7*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
D = v_p / S	*26.6*	pc/mi/ln	S		mph
LOS	*D*		D = v_p / S		pc/mi/ln
			Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4220*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1525*	pc/h/ln
S	*64.8*	mph
D = v_p / S	*23.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1265 ft
V_D = 680 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4650	0.94	Level	6	0	0.971	1.00	5095
Ramp	650	0.94	Level	6	0	0.971	1.00	712
UpStream								
DownStream	680	0.94	Level	6	0	0.971	1.00	745

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.600 using Equation (Exhibit 25-12)
V_{12} = 3341 pc/h
V_3 or V_{av34} 1754 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5095	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4383	Exhibit 25-14	7050	No
V_R	712	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3341	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 31.7 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.297 (Exhibit 25-19)
S_R= 58.2 mph (Exhibit 25-19)
S_0= 68.4 mph (Exhibit 25-19)
S = 61.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1265 ft
V_D = 480 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4220	0.95	Level	6	0	0.971	1.00	4575
Ramp	680	0.95	Level	6	0	0.971	1.00	737
UpStream								
DownStream	480	0.95	Level	6	0	0.971	1.00	520

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.612 using Equation (Exhibit 25-12)
V_{12} = 3085 pc/h
V_3 or V_{av34} 1490 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4575	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	3838	Exhibit 25-14	7050	No
V_R	737	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3085	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 29.5 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.299 (Exhibit 25-19)
S_R= 58.1 mph (Exhibit 25-19)
S_0= 69.4 mph (Exhibit 25-19)
S = 61.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	4000	V_D = veh/h
		Ramp Volume, V_R	680	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4000	0.94	Level	6	0	0.971	1.00	4383
Ramp	680	0.94	Level	6	0	0.971	1.00	745
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.125 using Equation (Exhibit 13-6)

V_{12} = 546 pc/h

V_3 or V_{av34} 1918 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1753 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5128	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2498	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.308 (Exibit 13-11)

S_R= 57.9 mph (Exhibit 13-11)

S_0= 62.1 mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	3540	V_D = veh/h
		Ramp Volume, V_R	480	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3540	0.95	Level	6	0	0.971	1.00	3838
Ramp	480	0.95	Level	6	0	0.971	1.00	520
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.153 using Equation (Exhibit 13-6)

V_{12} = 586 pc/h

V_3 or V_{av34} 1626 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1535 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4358	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2055	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 17.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.291 (Exibit 13-11)

S_R= 58.3 mph (Exhibit 13-11)

S_0= 62.7 mph (Exhibit 13-11)

S = 60.5 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4680*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1282*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*19.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4020*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1090*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*16.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2745 ft
V_D = 740 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4070	0.94	Level	7	0	0.966	1.00	4481
Ramp	560	0.94	Level	7	0	0.966	1.00	617
UpStream								
DownStream	740	0.94	Level	7	0	0.966	1.00	815

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.620 using Equation (Exhibit 25-12)
V_{12} = 3011 pc/h
V_3 or V_{av34} 1470 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4481	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	3864	Exhibit 25-14	7050	No
V_R	617	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3011	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 28.9 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.289 (Exhibit 25-19)
S_R= 58.4 mph (Exhibit 25-19)
S_0= 69.5 mph (Exhibit 25-19)
S = 61.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2745 ft
V_D = 690 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4340	0.95	Level	7	0	0.966	1.00	4728
Ramp	460	0.95	Level	7	0	0.966	1.00	501
UpStream								
DownStream	690	0.95	Level	7	0	0.966	1.00	752

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.619 using Equation (Exhibit 25-12)
V_{12} = 3116 pc/h
V_3 or V_{av34} 1612 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4728	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4227	Exhibit 25-14	7050	No
V_R	501	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3116	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 29.8 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.278 (Exhibit 25-19)
S_R= 58.6 mph (Exhibit 25-19)
S_0= 68.9 mph (Exhibit 25-19)
S = 61.8 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4070*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1494*	pc/h/ln
S	*64.9*	mph
D = v_p / S	*23.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4340*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1576*	pc/h/ln
S	*64.6*	mph
D = v_p / S	*24.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2085 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	210 veh/h	Freeway Volume, V_F	3460	V_D = veh/h
		Ramp Volume, V_R	610	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3460	0.94	Level	7	0	0.966	1.00	3810
Ramp	610	0.94	Level	15	0	0.930	1.00	698
UpStream	210	0.94	Level	6	0	0.971	1.00	230
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1444.11 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2264 pc/h

V_3 or V_{av34} 1546 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4508	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2962	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.336 (Exibit 13-11)

S_R= 57.3 mph (Exhibit 13-11)

S_0= 61.2 mph (Exhibit 13-11)

S = 58.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2085 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	450 veh/h	Freeway Volume, V_F	3800	V_D = veh/h
		Ramp Volume, V_R	540	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3800	0.95	Level	6	0	0.971	1.00	4120
Ramp	540	0.95	Level	15	0	0.930	1.00	611
UpStream	450	0.94	Level	6	0	0.971	1.00	493
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1491.83 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2449 pc/h

V_3 or V_{av34} 1671 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4731	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3060	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.344 (Exibit 13-11)

S_R= 57.1 mph (Exhibit 13-11)

S_0= 60.8 mph (Exhibit 13-11)

S = 58.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	1360ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2715	0.94	6	0	1.5	1.2	0.971	1.00	2975
V_{RF}	745	0.94	6	0	1.5	1.2	0.971	1.00	816
V_{FR}	165	0.94	6	0	1.5	1.2	0.971	1.00	181
V_{RR}	45	0.94	6	0	1.5	1.2	0.971	1.00	49
V_{NW}	3024							V =	4021
V_W	997								
VR	0.248								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	816 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1127 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	590 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1717 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	288

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4021 pc/h	Weaving intensity factor, W	0.272
Weaving segment capacity, c_w	8501 veh/h	Weaving segment speed, S	54.3 mph
Weaving segment v/c ratio	0.459	Average weaving speed, S_W	54.3 mph
Weaving segment density, D	18.5 pc/mi/ln	Average non-weaving speed, S_{NW}	54.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3466 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3360	0.95	6	0	1.5	1.2	0.971	1.00	3643
V_{RF}	440	0.95	6	0	1.5	1.2	0.971	1.00	477
V_{FR}	400	0.95	6	0	1.5	1.2	0.971	1.00	434
V_{RR}	50	0.95	6	0	1.5	1.2	0.971	1.00	54
V_{NW}	3697							V =	4608
V_W	911								
VR	0.198								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	477 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	788 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	728 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1516 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	352

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4608 pc/h	Weaving intensity factor, W	0.246
Weaving segment capacity, c_w	8656 veh/h	Weaving segment speed, S	55.9 mph
Weaving segment v/c ratio	0.517	Average weaving speed, S_W	55.1 mph
Weaving segment density, D	20.6 pc/mi/ln	Average non-weaving speed, S_{NW}	56.0 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	2947 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Greenspot On / Base Line Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2500ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2610	0.94	6	0	1.5	1.2	0.971	1.00	2860
V_{RF}	270	0.94	6	0	1.5	1.2	0.971	1.00	296
V_{FR}	580	0.94	6	0	1.5	1.2	0.971	1.00	636
V_{RR}	0	0.94	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	2860							V =	3792
V_W	932								
VR	0.246								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	932 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1442 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1174 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2616 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	715

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3792 pc/h	Weaving intensity factor, W	0.234
Weaving segment capacity, c_w	8381 veh/h	Weaving segment speed, S	54.2 mph
Weaving segment v/c ratio	0.439	Average weaving speed, S_W	55.5 mph
Weaving segment density, D	17.5 pc/mi/ln	Average non-weaving speed, S_{NW}	53.7 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	5010 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Greenspot On / Base Line Off
Analysis Year	2020 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	2500ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3310	0.95	6	0	1.5	1.2	0.971	1.00	3589
V_{RF}	450	0.95	6	0	1.5	1.2	0.971	1.00	488
V_{FR}	630	0.95	6	0	1.5	1.2	0.971	1.00	683
V_{RR}	0	0.95	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	3589							V =	4760
V_W	1171								
VR	0.246								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1171 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1681 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1324 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3005 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	897

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4760 pc/h	Weaving intensity factor, W	0.261
Weaving segment capacity, c_w	8381 veh/h	Weaving segment speed, S	51.7 mph
Weaving segment v/c ratio	0.551	Average weaving speed, S_W	54.6 mph
Weaving segment density, D	23.0 pc/mi/ln	Average non-weaving speed, S_{NW}	50.9 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5012 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd Off / On
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2090 ft
V_D = 270 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3950	0.94	Level	6	0	0.971	1.00	4328
Ramp	760	0.94	Level	6	0	0.971	1.00	833
UpStream								
DownStream	270	0.94	Level	6	0	0.971	1.00	296

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.613 using Equation (Exhibit 25-12)
V_{12} = 2977 pc/h
V_3 or V_{av34} 1351 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4328	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	3495	Exhibit 25-14	7050	No
V_R	833	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2977	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 28.6 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.308 (Exhibit 25-19)
S_R= 57.9 mph (Exhibit 25-19)
S_0= 69.9 mph (Exhibit 25-19)
S = 61.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Rd Off / On
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2090 ft
V_D = 450 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5110	0.95	Level	6	0	0.971	1.00	5540
Ramp	1170	0.95	Level	6	0	0.971	1.00	1269
UpStream								
DownStream	450	0.95	Level	6	0	0.971	1.00	488

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.563 using Equation (Exhibit 25-12)
V_{12} = 3674 pc/h
V_3 or V_{av34} 1866 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5540	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4271	Exhibit 25-14	7050	No
V_R	1269	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3674	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 34.6 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.347 (Exhibit 25-19)
S_R= 57.0 mph (Exhibit 25-19)
S_0= 67.9 mph (Exhibit 25-19)
S = 60.3 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3950*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1443*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*22.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/GreenspotOff*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5110*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1847*	pc/h/ln
S	*62.2*	mph
D = v_p / S	*29.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1650 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	270 veh/h	Freeway Volume, V_F	3150	V_D = veh/h
		Ramp Volume, V_R	800	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3150	0.94	Level	6	0	0.971	1.00	3452
Ramp	800	0.94	Level	6	0	0.971	1.00	877
UpStream	270	0.94	Level	6	0	0.971	1.00	296
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1405.81 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2052 pc/h

V_3 or V_{av34} 1400 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4329	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2929	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.334 (Exibit 13-11)

S_R= 57.3 mph (Exhibit 13-11)

S_0= 61.8 mph (Exhibit 13-11)

S = 58.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1650 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	870 veh/h	Freeway Volume, V_F	4020	V_D = veh/h
		Ramp Volume, V_R	1090	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4020	0.95	Level	6	0	0.971	1.00	4359
Ramp	1090	0.95	Level	6	0	0.971	1.00	1182
UpStream	870	0.95	Level	6	0	0.971	1.00	943
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1665.17 (Equation 13-6 or 13-7)

P_{FM} = 0.593 using Equation (Exhibit 13-6)

V_{12} = 2586 pc/h

V_3 or V_{av34} 1773 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5541	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3768	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.430 (Exibit 13-11)

S_R= 55.1 mph (Exhibit 13-11)

S_0= 60.4 mph (Exhibit 13-11)

S = 56.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1650 ft
V_D = 800 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3420	0.94	Level	6	0	0.971	1.00	3747
Ramp	270	0.94	Level	6	0	0.971	1.00	296
UpStream								
DownStream	800	0.94	Level	6	0	0.971	1.00	877

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.653 using Equation (Exhibit 25-12)
V_{12} = 2548 pc/h
V_3 or V_{av34} 1199 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3747	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	3451	Exhibit 25-14	7050	No
V_R	296	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2548	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 24.9 (pc/mi/ln)
LOS = C (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.260 (Exhibit 25-19)
S_R= 59.0 mph (Exhibit 25-19)
S_0= 70.5 mph (Exhibit 25-19)
S = 62.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2020 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1650 ft
V_D = 1090 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4890	0.95	Level	6	0	0.971	1.00	5302
Ramp	870	0.95	Level	6	0	0.971	1.00	943
UpStream								
DownStream	1090	0.95	Level	6	0	0.971	1.00	1182

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.584 using Equation (Exhibit 25-12)
V_{12} = 3489 pc/h
V_3 or V_{av34} 1813 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5302	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4359	Exhibit 25-14	7050	No
V_R	943	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3489	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.0 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.318 (Exhibit 25-19)
S_R= 57.7 mph (Exhibit 25-19)
S_0= 68.1 mph (Exhibit 25-19)
S = 60.9 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3420*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1249*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*19.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4890*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1767*	pc/h/ln	Design LOS	
S	*63.1*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
D = v_p / S	*28.0*	pc/mi/ln	S	mph
LOS	*D*		D = v_p / S	pc/mi/ln
			Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5040*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1850*	pc/h/ln
S	*62.1*	mph
D = v_p / S	*29.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5190*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1885*	pc/h/ln
S	*61.7*	mph
D = v_p / S	*30.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 4080	
	Ramp Volume, V_R: 540	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4080	0.94	Level	7	0	0.966	1.00	4492
Ramp	540	0.94	Level	7	0	0.966	1.00	595
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4492 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5087	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5087	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 41.1 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.892 (Exibit 13-11)

S_R= 44.5 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 44.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 4340	
	Ramp Volume, V_R: 400	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4340	0.95	Level	7	0	0.966	1.00	4728
Ramp	400	0.95	Level	7	0	0.966	1.00	436
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4728 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5164	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5164	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 41.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.943 (Exibit 13-11)

S_R= 43.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 43.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden Ave On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4620*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2543*	pc/h/ln
S	*46.5*	mph
D = v_p / S	*54.7*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden Ave On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4740*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2582*	pc/h/ln
S	*45.2*	mph
D = v_p / S	*57.1*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Victoria On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4170*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2296*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*53.6*	mph	S	mph
D = v_p / S	*42.8*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Victoria On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4290*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2337*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*52.6*	mph	S	mph
D = v_p / S	*44.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	4170
Ramp Volume, V_R	480
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4170	0.94	Level	7	0	0.966	1.00	4591
Ramp	480	0.94	Level	15	0	0.930	1.00	549
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4591 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4591	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	4042	Exhibit 13-8	4700	No
V_R	549	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4591	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.282 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	4290
Ramp Volume, V_R	460
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4290	0.95	Level	7	0	0.966	1.00	4674
Ramp	460	0.95	Level	15	0	0.930	1.00	521
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4674 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4674	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	4153	Exhibit 13-8	4700	No
V_R	521	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4674	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.280 (Exhibit 13-12)

S_R= 58.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.6 mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2040 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3050	0.94	6	0	1.5	1.2	0.971	1.00	3342
V_{RF}	480	0.94	6	0	1.5	1.2	0.971	1.00	526
V_{FR}	640	0.94	6	0	1.5	1.2	0.971	1.00	701
V_{RR}	100	0.94	6	0	1.5	1.2	0.971	1.00	110
V_{NW}	3452							V =	4679
V_W	1227								
VR	0.262								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	526 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	674 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	711 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1385 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	257

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4679 pc/h	Weaving intensity factor, W	0.278
Weaving segment capacity, c_w	6277 veh/h	Weaving segment speed, S	53.8 mph
Weaving segment v/c ratio	0.724	Average weaving speed, S_W	54.1 mph
Weaving segment density, D	29.0 pc/mi/ln	Average non-weaving speed, S_{NW}	53.7 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	3616 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2040 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3420	0.95	6	0	1.5	1.2	0.971	1.00	3708
V_{RF}	250	0.95	6	0	1.5	1.2	0.971	1.00	271
V_{FR}	410	0.95	6	0	1.5	1.2	0.971	1.00	445
V_{RR}	30	0.95	6	0	1.5	1.2	0.971	1.00	33
V_{NW}	3741							V =	4457
V_W	716								
VR	0.161								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	271 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	419 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	770 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1189 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	279

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4457 pc/h	Weaving intensity factor, W	0.247
Weaving segment capacity, c_w	6510 veh/h	Weaving segment speed, S	55.8 mph
Weaving segment v/c ratio	0.665	Average weaving speed, S_W	55.1 mph
Weaving segment density, D	26.6 pc/mi/ln	Average non-weaving speed, S_{NW}	55.9 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	2572 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Baseline Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3530	
	Ramp Volume, V_R: 940	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3530	0.94	Level	6	0	0.971	1.00	3868
Ramp	940	0.94	Level	6	0	0.971	1.00	1030
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3868 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4898	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4898	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 39.4 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.784 (Exibit 13-11)

S_R= 47.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 47.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Baseline Rd On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3670	
	Ramp Volume, V_R: 600	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3670	0.95	Level	6	0	0.971	1.00	3979
Ramp	600	0.95	Level	6	0	0.971	1.00	651
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3979 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4630	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4630	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 37.5 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.661 (Exibit 13-11)

S_R= 49.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 49.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4470*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2449*	pc/h/ln
S	*49.4*	mph
D = v_p / S	*49.6*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Base Line On / 5th St Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4270*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2315*	pc/h/ln
S	*53.1*	mph
D = v_p / S	*43.6*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	840	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	4470	V_D =	veh/h
		Ramp Volume, V_R	490		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4470	0.94	Level	6	0	0.971	1.00	4898
Ramp	490	0.94	Level	6	0	0.971	1.00	537
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4898 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4898	Exhibit 13-8	4700	Yes
$V_{FO} = V_F - V_R$	4361	Exhibit 13-8	4700	No
V_R	537	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4898	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 38.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.281 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D: 840	V_D = veh/h
	Freeway Volume, V_F: 4270	
	Ramp Volume, V_R: 680	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4270	0.95	Level	6	0	0.971	1.00	4630
Ramp	680	0.95	Level	6	0	0.971	1.00	737
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4630 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4630	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3893	Exhibit 13-8	4700	No
V_R	737	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4630	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 36.5 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.299 (Exhibit 13-12)

S_R= 58.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3980	
	Ramp Volume, V_R: 1140	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3980	0.94	Level	6	0	0.971	1.00	4361
Ramp	1140	0.94	Level	6	0	0.971	1.00	1249
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4361 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5610	Exhibit 13-8		Yes

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5610	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 44.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 1.326 (Exibit 13-11)

S_R= 34.5 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 34.5 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3590	
	Ramp Volume, V_R: 970	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3590	0.95	Level	6	0	0.971	1.00	3892
Ramp	970	0.95	Level	6	0	0.971	1.00	1052
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3892 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4944	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4944	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 39.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.808 (Exibit 13-11)

S_R= 46.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 46.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5120*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2805*	pc/h/ln
S	*37.0*	mph
D = v_p / S	*75.8*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4560*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2472*	pc/h/ln
S	*48.7*	mph
D = v_p / S	*50.8*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	5120
Ramp Volume, V_R	710
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 920 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5120	0.94	Level	6	0	0.971	1.00	5610
Ramp	710	0.94	Level	6	0	0.971	1.00	778
UpStream								
DownStream	920	0.94	Level	6	0	0.971	1.00	1008

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.584 using Equation (Exhibit 13-7)

V_{12} = 3600 pc/h

V_3 or V_{av34} 2010 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5610	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4832	Exhibit 13-8	7050	No
V_R	778	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3600	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 33.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.303 (Exhibit 13-12)

S_R= 58.0 mph (Exhibit 13-12)

S_0= 67.4 mph (Exhibit 13-12)

S = 61.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	4560
Ramp Volume, V_R	740
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 1265 ft

V_D = 710 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4560	0.95	Level	6	0	0.971	1.00	4944
Ramp	740	0.95	Level	6	0	0.971	1.00	802
UpStream								
DownStream	710	0.95	Level	6	0	0.971	1.00	770

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.600 using Equation (Exhibit 13-7)

V_{12} = 3285 pc/h

V_3 or V_{av34} 1659 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4944	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4142	Exhibit 13-8	7050	No
V_R	802	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3285	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 31.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.305 (Exhibit 13-12)

S_R= 58.0 mph (Exhibit 13-12)

S_0= 68.7 mph (Exhibit 13-12)

S = 61.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	4410	V_D = veh/h
		Ramp Volume, V_R	920	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4410	0.94	Level	6	0	0.971	1.00	4832
Ramp	920	0.94	Level	6	0	0.971	1.00	1008
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.092 using Equation (Exhibit 13-6)

V_{12} = 444 pc/h

V_3 or V_{av34} 2194 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1932 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5840	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2940	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.335 (Exibit 13-11)

S_R= 57.3 mph (Exhibit 13-11)

S_0= 61.6 mph (Exhibit 13-11)

S = 59.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	3820	V_D = veh/h
		Ramp Volume, V_R	710	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3820	0.95	Level	6	0	0.971	1.00	4142
Ramp	710	0.95	Level	6	0	0.971	1.00	770
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.122 using Equation (Exhibit 13-6)

V_{12} = 503 pc/h

V_3 or V_{av34} 1819 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1656 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4912	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2426	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 20.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.305 (Exibit 13-11)

S_R= 58.0 mph (Exhibit 13-11)

S_0= 62.3 mph (Exhibit 13-11)

S = 60.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5330*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1460*	pc/h/ln
S	*64.9*	mph
D = v_p / S	*22.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4530*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1228*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*18.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	141	V_D = veh/h
	Freeway Volume, V_F	4840	
	Ramp Volume, V_R	390	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4840	0.94	Level	7	0	0.966	1.00	5329
Ramp	390	0.94	Level	7	0	0.966	1.00	429
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 5329 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5329	Exhibit 13-8	4700	Yes
$V_{FO} = V_F - V_R$	4900	Exhibit 13-8	4700	Yes
V_R	429	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5329	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 48.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.272 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	4780	V_D =	veh/h
		Ramp Volume, V_R	380		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4780	0.95	Level	7	0	0.966	1.00	5208
Ramp	380	0.95	Level	7	0	0.966	1.00	414
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 5208 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5208	Exhibit 13-8	4700	Yes
$V_{FO} = V_F - V_R$	4794	Exhibit 13-8	4700	Yes
V_R	414	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5208	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 47.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.270 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Victoria On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4840*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2665*	pc/h/ln
S	*42.3*	mph
D = v_p / S	*63.0*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Victoria On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4780*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2604*	pc/h/ln
S	*44.4*	mph
D = v_p / S	*58.6*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4600*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2532*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*46.8*	mph	S	mph
D = v_p / S	*54.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*F*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4290*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2337*	pc/h/ln
S	*52.6*	mph
D = v_p / S	*44.5*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	3940	
	Ramp Volume, V_R	660	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3940	0.94	Level	6	0	0.971	1.00	4317
Ramp	660	0.94	Level	15	0	0.930	1.00	755
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4317 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5072	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5072	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 40.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 0.883 (Exibit 13-11)

S_R= 44.7 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 44.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	3700	
	Ramp Volume, V_R	590	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3700	0.95	Level	6	0	0.971	1.00	4012
Ramp	590	0.95	Level	15	0	0.930	1.00	668
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4012 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4680	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4680	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 37.9 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.681 (Exibit 13-11)

S_R= 49.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 49.3 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2040 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3090	0.94	6	0	1.5	1.2	0.971	1.00	3386
V_{RF}	850	0.94	6	0	1.5	1.2	0.971	1.00	931
V_{FR}	190	0.94	6	0	1.5	1.2	0.971	1.00	208
V_{RR}	50	0.94	6	0	1.5	1.2	0.971	1.00	55
V_{NW}	3441							V =	4580
V_W	1139								
VR	0.249								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	931 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1106 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	868 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1974 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	328

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4580 pc/h	Weaving intensity factor, W	0.303
Weaving segment capacity, c_w	6373 veh/h	Weaving segment speed, S	51.5 mph
Weaving segment v/c ratio	0.698	Average weaving speed, S_W	53.4 mph
Weaving segment density, D	29.6 pc/mi/ln	Average non-weaving speed, S_{NW}	51.0 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	3474 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2040 No Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	3
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2950	0.95	6	0	1.5	1.2	0.971	1.00	3198
V_{RF}	750	0.95	6	0	1.5	1.2	0.971	1.00	813
V_{FR}	390	0.95	6	0	1.5	1.2	0.971	1.00	423
V_{RR}	100	0.95	6	0	1.5	1.2	0.971	1.00	108
V_{NW}	3306							V =	4542
V_W	1236								
VR	0.272								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	813 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	988 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	840 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1828 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	315

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4542 pc/h	Weaving intensity factor, W	0.285
Weaving segment capacity, c_w	6317 veh/h	Weaving segment speed, S	52.4 mph
Weaving segment v/c ratio	0.698	Average weaving speed, S_W	53.9 mph
Weaving segment density, D	28.9 pc/mi/ln	Average non-weaving speed, S_{NW}	51.9 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	3721 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	850	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3880	V_D =	veh/h
		Ramp Volume, V_R	600		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3880	0.94	Level	6	0	0.971	1.00	4251
Ramp	600	0.94	Level	6	0	0.971	1.00	657
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4251 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4251	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3594	Exhibit 13-8	4700	No
V_R	657	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4251	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.292 (Exhibit 13-12)

S_R= 58.3 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Baseline Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	850	V_D = veh/h
	Freeway Volume, V_F	3910	
	Ramp Volume, V_R	570	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3910	0.95	Level	6	0	0.971	1.00	4239
Ramp	570	0.95	Level	6	0	0.971	1.00	618
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4239 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4239	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	3621	Exhibit 13-8	4700	No
V_R	618	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4239	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.289 (Exhibit 13-12)

S_R= 58.4 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.4 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Greenspot On / Base Line Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3880*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2126*	pc/h/ln
S	*57.5*	mph
D = v_p / S	*37.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*5th On / Base Line Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3910*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2120*	pc/h/ln
S	*57.6*	mph
D = v_p / S	*36.8*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3660	
	Ramp Volume, V_R: 220	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3660	0.94	Level	6	0	0.971	1.00	4010
Ramp	220	0.94	Level	6	0	0.971	1.00	241
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4010 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4251	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4251	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 34.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.535 (Exibit 13-11)

S_R= 52.7 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 52.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3610	
	Ramp Volume, V_R: 300	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3610	0.95	Level	6	0	0.971	1.00	3914
Ramp	300	0.95	Level	6	0	0.971	1.00	325
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3914 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4239	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4239	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 34.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.531 (Exibit 13-11)

S_R= 52.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 52.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	141	V_D = veh/h
	Freeway Volume, V_F	4370	
	Ramp Volume, V_R	710	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4370	0.94	Level	6	0	0.971	1.00	4788
Ramp	710	0.94	Level	6	0	0.971	1.00	778
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4788 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4788	Exhibit 13-8	4700	Yes
$V_{FO} = V_F - V_R$	4010	Exhibit 13-8	4700	No
V_R	778	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4788	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 44.2 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.303 (Exhibit 13-12)

S_R= 58.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	4660	V_D =	veh/h
		Ramp Volume, V_R	1050		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4660	0.95	Level	6	0	0.971	1.00	5052
Ramp	1050	0.95	Level	6	0	0.971	1.00	1138
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 5052 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5052	Exhibit 13-8	4700	Yes
$V_{FO} = V_F - V_R$	3914	Exhibit 13-8	4700	No
V_R	1138	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5052	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 46.4 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

D_s = 0.335 (Exhibit 13-12)

S_R= 57.3 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.3 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/Greenspot Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4370*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2394*	pc/h/ln
S	*51.0*	mph
D = v_p / S	*47.0*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4660*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2526*	pc/h/ln
S	*47.0*	mph
D = v_p / S	*53.7*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3440	
	Ramp Volume, V_R: 930	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3440	0.94	Level	6	0	0.971	1.00	3769
Ramp	930	0.94	Level	6	0	0.971	1.00	1019
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3769 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4788	Exhibit 13-8		Yes

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4788	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 38.6 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.729 (Exibit 13-11)

S_R= 48.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 48.2 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3690	
	Ramp Volume, V_R: 970	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3690	0.95	Level	6	0	0.971	1.00	4001
Ramp	970	0.95	Level	6	0	0.971	1.00	1052
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4001 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5053	Exhibit 13-8		Yes

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5053	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 40.6 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.871 (Exibit 13-11)

S_R= 45.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 45.0 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	141	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	3850	V_D =	veh/h
		Ramp Volume, V_R	410		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3850	0.94	Level	6	0	0.971	1.00	4219
Ramp	410	0.94	Level	6	0	0.971	1.00	449
UpStream								
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.634 using Equation (Exhibit 13-7)

V_{12} = 2839 pc/h

V_3 or V_{av34} 1380 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

	Actual	Capacity		LOS F?
V_F	4219	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	3770	Exhibit 13-8	7050	No
V_R	449	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2839	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 27.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.273 (Exhibit 13-12)

S_R= 58.7 mph (Exhibit 13-12)

S_0= 69.8 mph (Exhibit 13-12)

S = 61.9 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 No Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	141
Freeway Volume, V_F	4800
Ramp Volume, V_R	1110
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4800	0.95	Level	6	0	0.971	1.00	5204
Ramp	1110	0.95	Level	6	0	0.971	1.00	1203
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.575 using Equation (Exhibit 13-7)

V_{12} = 3502 pc/h

V_3 or V_{av34} 1702 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5204	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4001	Exhibit 13-8	7050	No
V_R	1203	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3502	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.341 (Exhibit 13-12)

S_R= 57.2 mph (Exhibit 13-12)

S_0= 68.6 mph (Exhibit 13-12)

S = 60.4 mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3850*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1406*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*21.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 No Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4800*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1735*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*63.4*	mph	S	mph
D = v_p / S	*27.4*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5270*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1934*	pc/h/ln
S	*61.0*	mph
D = v_p / S	*31.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*West of Highland Ave Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5580*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2026*	pc/h/ln
S	*59.4*	mph
D = v_p / S	*34.1*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Highland Ave Off
Date Performed	07/08/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	2
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	0
Freeway Volume, V_F	5270
Ramp Volume, V_R	890
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5270	0.94	Level	7	0	0.966	1.00	5803
Ramp	890	0.94	Level	7	0	0.966	1.00	980
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3150 pc/h

V_3 or V_{av34} 2653 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3316 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5803	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4823	Exhibit 13-8	7050	No
V_R	980	Exhibit 13-10	4200	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3150	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 25.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.321 (Exhibit 13-12)

S_R= 57.6 mph (Exhibit 13-12)

S_0= 65.5 mph (Exhibit 13-12)

S = 60.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Highland Ave Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	2
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	0
Freeway Volume, V_F	5580
Ramp Volume, V_R	740
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5580	0.95	Level	7	0	0.966	1.00	6079
Ramp	740	0.95	Level	7	0	0.966	1.00	806
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3179 pc/h

V_3 or V_{av34} 2900 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3473 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6079	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	5273	Exhibit 13-8	7050	No
V_R	806	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3179	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 26.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.306 (Exhibit 13-12)

S_R= 58.0 mph (Exhibit 13-12)

S_0= 65.0 mph (Exhibit 13-12)

S = 60.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	3810 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	890 veh/h	Freeway Volume, V_F	4380	V_D = veh/h
		Ramp Volume, V_R	550	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4380	0.94	Level	7	0	0.966	1.00	4823
Ramp	550	0.94	Level	7	0	0.966	1.00	606
UpStream	890	0.94	Level	7	0	0.966	1.00	980
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1641.21 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2866 pc/h

V_3 or V_{av34} 1957 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5429	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3472	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.387 (Exibit 13-11)

S_R= 56.1 mph (Exhibit 13-11)

S_0= 59.8 mph (Exhibit 13-11)

S = 57.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	Arden Ave On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	3810 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	740 veh/h	Freeway Volume, V_F	4840	V_D = veh/h
		Ramp Volume, V_R	390	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4840	0.95	Level	7	0	0.966	1.00	5273
Ramp	390	0.95	Level	7	0	0.966	1.00	425
UpStream	740	0.95	Level	7	0	0.966	1.00	806
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1698.77 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 3134 pc/h

V_3 or V_{av34} 2139 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5698	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3559	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.398 (Exibit 13-11)

S_R= 55.8 mph (Exhibit 13-11)

S_0= 59.1 mph (Exhibit 13-11)

S = 57.0 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden On / Victoria Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4930*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1809*	pc/h/ln
S	*62.6*	mph
D = v_p / S	*28.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Arden On / Victoria Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5230*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1899*	pc/h/ln
S	*61.5*	mph
D = v_p / S	*30.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Victoria On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4390*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1611*	pc/h/ln
S	*64.4*	mph
D = v_p / S	*25.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*Victoria On / SR-330 Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4720*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1714*	pc/h/ln	Design LOS	
S	*63.6*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
D = v_p / S	*26.9*	pc/mi/ln	S	mph
LOS	*D*		D = v_p / S	pc/mi/ln
			Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	1180	L_{down} =	3260 ft
V_u =	veh/h	Freeway Volume, V_F	4390	V_D =	580 veh/h
		Ramp Volume, V_R	490		
		Freeway Free-Flow Speed, S_{FF}	65.0		
		Ramp Free-Flow Speed, S_{FR}	50.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4390	0.94	Level	6	0	0.971	1.00	4810
Ramp	490	0.94	Level	6	0	0.971	1.00	537
UpStream								
DownStream	580	0.94	Level	6	0	0.971	1.00	636

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.615 using Equation (Exhibit 13-7)

V_{12} = 3165 pc/h

V_3 or V_{av34} 1645 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4810	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4273	Exhibit 13-8	7050	No
V_R	537	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3165	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 20.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.281 (Exhibit 13-12)

S_R= 58.5 mph (Exhibit 13-12)

S_0= 68.8 mph (Exhibit 13-12)

S = 61.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	SR-330 Off
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1180
Freeway Volume, V_F	4720
Ramp Volume, V_R	510
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{down} = 3260 ft

V_D = 360 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4720	0.95	Level	7	0	0.966	1.00	5142
Ramp	510	0.95	Level	15	0	0.930	1.00	577
UpStream								
DownStream	360	0.95	Level	6	0	0.971	1.00	390

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.605 using Equation (Exhibit 13-7)

V_{12} = 3338 pc/h

V_3 or V_{av34} 1804 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5142	Exhibit 13-8	7050	No
$V_{FO} = V_F - V_R$	4565	Exhibit 13-8	7050	No
V_R	577	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3338	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 22.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination

D_s = 0.285 (Exhibit 13-12)

S_R= 58.4 mph (Exhibit 13-12)

S_0= 68.2 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3300	0.94	6	0	1.5	1.2	0.971	1.00	3616
V_{RF}	490	0.94	6	0	1.5	1.2	0.971	1.00	537
V_{FR}	600	0.94	6	0	1.5	1.2	0.971	1.00	657
V_{RR}	90	0.94	6	0	1.5	1.2	0.971	1.00	99
V_{NW}	3715							V =	4909
V_W	1194								
VR	0.243								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	537 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	801 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	572 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1373 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	277

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4909 pc/h	Weaving intensity factor, W	0.276
Weaving segment capacity, c_w	8427 veh/h	Weaving segment speed, S	55.0 mph
Weaving segment v/c ratio	0.566	Average weaving speed, S_W	54.2 mph
Weaving segment density, D	22.3 pc/mi/ln	Average non-weaving speed, S_{NW}	55.2 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3417 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	SR-330 On / Base Line Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1065ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3675	0.95	6	0	1.5	1.2	0.971	1.00	3984
V_{RF}	315	0.95	6	0	1.5	1.2	0.971	1.00	342
V_{FR}	535	0.95	6	0	1.5	1.2	0.971	1.00	580
V_{RR}	45	0.95	6	0	1.5	1.2	0.971	1.00	49
V_{NW}	4033							V =	4955
V_W	922								
VR	0.186								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	342 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	606 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	638 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1244 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	301

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4955 pc/h	Weaving intensity factor, W	0.255
Weaving segment capacity, c_w	8602 veh/h	Weaving segment speed, S	56.3 mph
Weaving segment v/c ratio	0.559	Average weaving speed, S_W	54.8 mph
Weaving segment density, D	22.0 pc/mi/ln	Average non-weaving speed, S_{NW}	56.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	2828 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	Base Line On / 5th Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	2500ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3280	0.94	6	0	1.5	1.2	0.971	1.00	3594
V_{RF}	990	0.94	6	0	1.5	1.2	0.971	1.00	1085
V_{FR}	510	0.94	6	0	1.5	1.2	0.971	1.00	559
V_{RR}	0	0.94	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	3594							V =	5238
V_W	1644								
VR	0.314								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1644 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	2154 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1325 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3479 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	899

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5238 pc/h	Weaving intensity factor, W	0.293
Weaving segment capacity, c_w	7424 veh/h	Weaving segment speed, S	48.8 mph
Weaving segment v/c ratio	0.685	Average weaving speed, S_W	53.7 mph
Weaving segment density, D	26.8 pc/mi/ln	Average non-weaving speed, S_{NW}	46.9 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5733 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-210 EB
Weaving Segment Location	Base Line On / 5th Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2500ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3220	0.95	6	0	1.5	1.2	0.971	1.00	3491
V_{RF}	660	0.95	6	0	1.5	1.2	0.971	1.00	716
V_{FR}	770	0.95	6	0	1.5	1.2	0.971	1.00	835
V_{RR}	0	0.95	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	3491							V =	5042
V_W	1551								
VR	0.308								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1551 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	2061 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1304 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3365 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	873

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5042 pc/h	Weaving intensity factor, W	0.286
Weaving segment capacity, c_w	7575 veh/h	Weaving segment speed, S	49.5 mph
Weaving segment v/c ratio	0.646	Average weaving speed, S_W	53.9 mph
Weaving segment density, D	25.5 pc/mi/ln	Average non-weaving speed, S_{NW}	47.8 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5666 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 2210 ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = 510 veh/h	Deceleration Lane Length L_D	V_D = veh/h
	Freeway Volume, V_F: 4270	
	Ramp Volume, V_R: 1200	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4270	0.94	Level	6	0	0.971	1.00	4679
Ramp	1200	0.94	Level	6	0	0.971	1.00	1315
UpStream	510	0.94	Level	6	0	0.971	1.00	559
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1762.12 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2781 pc/h

V_3 or V_{av34} 1898 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5994	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4096	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 33.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.495 (Exibit 13-11)

S_R= 53.6 mph (Exhibit 13-11)

S_0= 60.0 mph (Exhibit 13-11)

S = 55.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	5th St On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2210 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	770 veh/h	Freeway Volume, V_F	3880	V_D = veh/h
		Ramp Volume, V_R	1040	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3880	0.95	Level	6	0	0.971	1.00	4207
Ramp	1040	0.95	Level	6	0	0.971	1.00	1128
UpStream	770	0.95	Level	6	0	0.971	1.00	835
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1621.09 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2500 pc/h

V_3 or V_{av34} 1707 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5335	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3628	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.408 (Exibit 13-11)

S_R= 55.6 mph (Exhibit 13-11)

S_0= 60.7 mph (Exhibit 13-11)

S = 57.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2020 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5470*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1998*	pc/h/ln
S	*59.9*	mph
D = v_p / S	*33.3*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*5th St On / San Bernardino Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3880*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1402*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*21.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1265 ft
V_D = 920 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5470	0.94	Level	6	0	0.971	1.00	5994
Ramp	750	0.94	Level	6	0	0.971	1.00	822
UpStream								
DownStream	920	0.94	Level	6	0	0.971	1.00	1008

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.572 using Equation (Exhibit 25-12)
V_{12} = 3782 pc/h
V_3 or V_{av34} 2212 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5994	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	5172	Exhibit 25-14	7050	No
V_R	822	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3782	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 35.5 (pc/mi/ln)
LOS = E (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.307 (Exhibit 25-19)
S_R= 57.9 mph (Exhibit 25-19)
S_0= 66.6 mph (Exhibit 25-19)
S = 60.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1265 ft
V_D = 660 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4920	0.95	Level	6	0	0.971	1.00	5334
Ramp	770	0.95	Level	6	0	0.971	1.00	835
UpStream								
DownStream	660	0.95	Level	6	0	0.971	1.00	716

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.588 using Equation (Exhibit 25-12)
V_{12} = 3481 pc/h
V_3 or V_{av34} 1853 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5334	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4499	Exhibit 25-14	7050	No
V_R	835	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3481	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 32.9 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.308 (Exhibit 25-19)
S_R= 57.9 mph (Exhibit 25-19)
S_0= 68.0 mph (Exhibit 25-19)
S = 61.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 4	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 600	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 4720	
	Ramp Volume, V_R: 920	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4720	0.94	Level	6	0	0.971	1.00	5172
Ramp	920	0.94	Level	6	0	0.971	1.00	1008
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.092 using Equation (Exhibit 13-6)

V_{12} = 475 pc/h

V_3 or V_{av34} 2348 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2068 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6180	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3076	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.346 (Exibit 13-11)

S_R= 57.1 mph (Exhibit 13-11)

S_0= 61.2 mph (Exhibit 13-11)

S = 59.1 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 EB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	12/18/2012	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	veh/h	Freeway Volume, V_F	4150	V_D = veh/h
		Ramp Volume, V_R	660	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4150	0.95	Level	6	0	0.971	1.00	4499
Ramp	660	0.95	Level	6	0	0.971	1.00	716
UpStream								
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.128 using Equation (Exhibit 13-6)

V_{12} = 577 pc/h

V_3 or V_{av34} 1961 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 1799 pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5215	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2515	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 21.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.309 (Exibit 13-11)

S_R= 57.9 mph (Exhibit 13-11)

S_0= 61.9 mph (Exhibit 13-11)

S = 59.9 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5640*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1545*	pc/h/ln
S	*64.7*	mph
D = v_p / S	*23.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 EB*
Agency or Company	*URS*	From/To	*South of San Bernardino*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4810*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1304*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*20.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2745 ft
V_D = 460 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5380	0.94	Level	7	0	0.966	1.00	5924
Ramp	310	0.94	Level	7	0	0.966	1.00	341
UpStream								
DownStream	460	0.94	Level	7	0	0.966	1.00	506

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.596 using Equation (Exhibit 25-12)
V_{12} = 3670 pc/h
V_3 or V_{av34} 2254 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5924	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	5583	Exhibit 25-14	7050	No
V_R	341	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3670	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 34.5 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.264 (Exhibit 25-19)
S_R= 58.9 mph (Exhibit 25-19)
S_0= 66.4 mph (Exhibit 25-19)
S = 61.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Highland Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2745 ft
V_D = 710 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5680	0.95	Level	7	0	0.966	1.00	6188
Ramp	340	0.95	Level	7	0	0.966	1.00	370
UpStream								
DownStream	710	0.95	Level	7	0	0.966	1.00	774

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.588 using Equation (Exhibit 25-12)
V_{12} = 3793 pc/h
V_3 or V_{av34} 2395 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6188	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	5818	Exhibit 25-14	7050	No
V_R	370	Exhibit 25-3	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3793	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 35.6 (pc/mi/ln)
LOS = E (Exhibit 25-4)

Speed Determination

D_s = 0.266 (Exhibit 25-19)
S_R= 58.9 mph (Exhibit 25-19)
S_0= 65.9 mph (Exhibit 25-19)
S = 61.4 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Victoria On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5380*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1975*	pc/h/ln	Design LOS	
S	*60.3*	mph	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
D = v_p / S	*32.7*	pc/mi/ln	S	mph
LOS	*D*		D = v_p / S	pc/mi/ln
			Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*Victoria On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5680*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2063*	pc/h/ln
S	*58.8*	mph
D = v_p / S	*35.1*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5090*	veh/h	Peak-Hour Factor, PHF	*0.94*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1868*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*61.9*	mph	S	mph
D = v_p / S	*30.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SR-330 On / Highland Off*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5250*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*7*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1907*	pc/h/ln
S	*61.4*	mph
D = v_p / S	*31.1*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	50.0	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2085 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	250 veh/h	Freeway Volume, V_F	4400	V_D = veh/h
		Ramp Volume, V_R	690	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4400	0.94	Level	6	0	0.971	1.00	4821
Ramp	690	0.94	Level	15	0	0.930	1.00	789
UpStream	250	0.94	Level	6	0	0.971	1.00	274
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1679.94 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2865 pc/h

V_3 or V_{av34} 1956 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5610	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3654	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.412 (Exibit 13-11)

S_R= 55.5 mph (Exhibit 13-11)

S_0= 59.8 mph (Exhibit 13-11)

S = 56.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	SR-330 On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	2085 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	510 veh/h	Freeway Volume, V_F	4570	V_D = veh/h
		Ramp Volume, V_R	680	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4570	0.95	Level	6	0	0.971	1.00	4955
Ramp	680	0.95	Level	15	0	0.930	1.00	769
UpStream	510	0.95	Level	6	0	0.971	1.00	553
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1704.34 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2945 pc/h

V_3 or V_{av34} 2010 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5724	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3714	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 30.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.421 (Exibit 13-11)

S_R= 55.3 mph (Exhibit 13-11)

S_0= 59.6 mph (Exhibit 13-11)

S = 56.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3540	0.94	6	0	1.5	1.2	0.971	1.00	3879
V_{RF}	860	0.94	6	0	1.5	1.2	0.971	1.00	942
V_{FR}	200	0.94	6	0	1.5	1.2	0.971	1.00	219
V_{RR}	50	0.94	6	0	1.5	1.2	0.971	1.00	55
V_{NW}	3934							V =	5095
V_W	1161								
VR	0.228								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	942 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1253 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	777 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	2030 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	375

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5095 pc/h	Weaving intensity factor, W	0.310
Weaving segment capacity, c_w	8563 veh/h	Weaving segment speed, S	52.3 mph
Weaving segment v/c ratio	0.578	Average weaving speed, S_W	53.2 mph
Weaving segment density, D	24.3 pc/mi/ln	Average non-weaving speed, S_{NW}	52.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3257 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Base Line On / SR-330 Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided
Weaving number of lanes, N	4
Weaving segment length, L_S	1360ft
Freeway free-flow speed, FFS	65 mph
Segment type	Freeway
Freeway minimum speed, S_{MIN}	15
Freeway maximum capacity, C_{IFL}	2350
Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3895	0.95	6	0	1.5	1.2	0.971	1.00	4223
V_{RF}	675	0.95	6	0	1.5	1.2	0.971	1.00	732
V_{FR}	435	0.95	6	0	1.5	1.2	0.971	1.00	472
V_{RR}	75	0.95	6	0	1.5	1.2	0.971	1.00	81
V_{NW}	4304							V =	5508
V_W	1204								
VR	0.219								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	3 lc	Minimum weaving lane changes, LC_{MIN}	732 lc/h
Interchange density, ID	0.7 int/mi	Weaving lane changes, LC_W	1043 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	853 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1896 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	410

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5508 pc/h	Weaving intensity factor, W	0.294
Weaving segment capacity, c_w	8590 veh/h	Weaving segment speed, S	53.2 mph
Weaving segment v/c ratio	0.623	Average weaving speed, S_W	53.6 mph
Weaving segment density, D	25.9 pc/mi/ln	Average non-weaving speed, S_{NW}	53.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	3161 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	AM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Greenspot On / Base Line Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2500ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	3460	0.94	6	0	1.5	1.2	0.971	1.00	3791
V_{RF}	280	0.94	6	0	1.5	1.2	0.971	1.00	307
V_{FR}	620	0.94	6	0	1.5	1.2	0.971	1.00	679
V_{RR}	0	0.94	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	3791							V =	4777
V_W	986								
VR	0.206								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	986 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1496 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1366 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2862 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	948

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4777 pc/h	Weaving intensity factor, W	0.251
Weaving segment capacity, c_w	8501 veh/h	Weaving segment speed, S	52.7 mph
Weaving segment v/c ratio	0.546	Average weaving speed, S_W	55.0 mph
Weaving segment density, D	22.7 pc/mi/ln	Average non-weaving speed, S_{NW}	52.2 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4602 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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SR-210 Widening PAED

FREEWAY WEAVING WORKSHEET

General Information

Analyst	KT
Agency/Company	URS
Date Performed	10/7/2013
Analysis Time Period	PM

Site Information

Freeway/Dir of Travel	SR-219 WB
Weaving Segment Location	Greenspot On / Base Line Off
Analysis Year	2040 Build

Project Description *SR-210 Widening PAED*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2500ft	Freeway maximum capacity, C_{IFL}	2350
Freeway free-flow speed, FFS	65 mph	Terrain type	Level

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3860	0.95	6	0	1.5	1.2	0.971	1.00	4185
V_{RF}	470	0.95	6	0	1.5	1.2	0.971	1.00	510
V_{FR}	670	0.95	6	0	1.5	1.2	0.971	1.00	726
V_{RR}	0	0.95	6	0	1.5	1.2	0.971	1.00	0
V_{NW}	4185							V =	5421
V_W	1236								
VR	0.228								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1236 lc/h
Interchange density, ID	1.0 int/mi	Weaving lane changes, LC_W	1746 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1447 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3193 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1046

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5421 pc/h	Weaving intensity factor, W	0.274
Weaving segment capacity, c_w	8435 veh/h	Weaving segment speed, S	50.6 mph
Weaving segment v/c ratio	0.624	Average weaving speed, S_W	54.2 mph
Weaving segment density, D	26.8 pc/mi/ln	Average non-weaving speed, S_{NW}	49.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4824 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2090 ft
V_D = 280 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4880	0.94	Level	6	0	0.971	1.00	5347
Ramp	800	0.94	Level	6	0	0.971	1.00	877
UpStream								
DownStream	280	0.94	Level	6	0	0.971	1.00	307

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.586 using Equation (Exhibit 25-12)
V_{12} = 3496 pc/h
V_3 or V_{av34} 1851 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5347	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4470	Exhibit 25-14	7050	No
V_R	877	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3496	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 33.0 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.312 (Exhibit 25-19)
S_R= 57.8 mph (Exhibit 25-19)
S_0= 68.0 mph (Exhibit 25-19)
S = 61.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	Greenspot Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2090 ft
V_D = 470 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5780	0.95	Level	6	0	0.971	1.00	6267
Ramp	1250	0.95	Level	6	0	0.971	1.00	1355
UpStream								
DownStream	470	0.95	Level	6	0	0.971	1.00	510

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.541 using Equation (Exhibit 25-12)
V_{12} = 4012 pc/h
V_3 or V_{av34} 2255 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6267	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4912	Exhibit 25-14	7050	No
V_R	1355	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4012	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 37.5 (pc/mi/ln)
LOS = E (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.355 (Exhibit 25-19)
S_R= 56.8 mph (Exhibit 25-19)
S_0= 66.4 mph (Exhibit 25-19)
S = 59.9 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*SanBernardino On/GreenspotOff*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4880*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1782*	pc/h/ln
S	*62.9*	mph
D = v_p / S	*28.3*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5780*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2089*	pc/h/ln
S	*58.3*	mph
D = v_p / S	*35.9*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1650 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	420 veh/h	Freeway Volume, V_F	3850	V_D = veh/h
		Ramp Volume, V_R	1030	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3850	0.94	Level	6	0	0.971	1.00	4219
Ramp	1030	0.94	Level	6	0	0.971	1.00	1129
UpStream	420	0.94	Level	6	0	0.971	1.00	460
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1623.87 (Equation 13-6 or 13-7)

P_{FM} = 0.594 using Equation (Exhibit 13-6)

V_{12} = 2507 pc/h

V_3 or V_{av34} 1712 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5348	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3636	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 29.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.409 (Exibit 13-11)

S_R= 55.6 mph (Exhibit 13-11)

S_0= 60.6 mph (Exhibit 13-11)

S = 57.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	KT	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino On
Date Performed	10/8/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	3	Downstream Adj Ramp
☑ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☐ No	☑ Off	Acceleration Lane Length, L_A	600	☑ No ☐ Off
L_{up} =	1650 ft	Deceleration Lane Length L_D		L_{down} = ft
V_u =	1110 veh/h	Freeway Volume, V_F	4510	V_D = veh/h
		Ramp Volume, V_R	1270	
		Freeway Free-Flow Speed, S_{FF}	65.0	
		Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4510	0.95	Level	6	0	0.971	1.00	4890
Ramp	1270	0.95	Level	6	0	0.971	1.00	1377
UpStream	1110	0.95	Level	6	0	0.971	1.00	1203
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1820.54 (Equation 13-6 or 13-7)

P_{FM} = 0.583 using Equation (Exhibit 13-6)

V_{12} = 2853 pc/h

V_3 or V_{av34} 2037 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6267	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4230	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 34.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.529 (Exibit 13-11)

S_R= 52.8 mph (Exhibit 13-11)

S_0= 59.5 mph (Exhibit 13-11)

S = 54.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	AM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1650 ft
V_D = 1030 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4270	0.94	Level	6	0	0.971	1.00	4679
Ramp	420	0.94	Level	6	0	0.971	1.00	460
UpStream								
DownStream	1030	0.93	Level	6	0	0.971	1.00	1141

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.622 using Equation (Exhibit 25-12)
V_{12} = 3084 pc/h
V_3 or V_{av34} 1595 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4679	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4219	Exhibit 25-14	7050	No
V_R	460	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3084	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 29.5 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.274 (Exhibit 25-19)
S_R= 58.7 mph (Exhibit 25-19)
S_0= 69.0 mph (Exhibit 25-19)
S = 61.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	GK	Freeway/Dir of Travel	SR-210 WB
Agency or Company	URS	Junction	San Bernardino Off
Date Performed	10/14/2013	Jurisdiction	
Analysis Time Period	PM	Analysis Year	2040 Build

Project Description SR-210 Widening PAED

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Level

S_{FF} = 65.0 mph S_{FR} = 50.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1650 ft
V_D = 1270 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5620	0.95	Level	6	0	0.971	1.00	6093
Ramp	1110	0.95	Level	6	0	0.971	1.00	1203
UpStream								
DownStream	1270	0.94	Level	6	0	0.971	1.00	1392

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.552 using Equation (Exhibit 25-12)
V_{12} = 3904 pc/h
V_3 or V_{av34} 2189 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6093	Exhibit 25-14	7050	No
$V_{FO} = V_F - V_R$	4890	Exhibit 25-14	7050	No
V_R	1203	Exhibit 25-3	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3904	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 36.6 (pc/mi/ln)
LOS = E (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.341 (Exhibit 25-19)
S_R= 57.2 mph (Exhibit 25-19)
S_0= 66.7 mph (Exhibit 25-19)
S = 60.2 mph (Exhibit 25-15)

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*AM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4270*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*3*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1560*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*64.6*	mph	S	mph
D = v_p / S	*24.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*KT*	Highway/Direction of Travel	*SR-210 WB*
Agency or Company	*URS*	From/To	*From I-10*
Date Performed	*10/7/2013*	Jurisdiction	
Analysis Time Period	*PM*	Analysis Year	*2040 Build*

Project Description *SR-210 Widening PAED*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5620*	veh/h	Peak-Hour Factor, PHF	*0.95*	
AADT		veh/day	%Trucks and Buses, P_T	*6*	
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*	
Peak-Hr Direction Prop, D			General Terrain:	*Level*	
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2031*	pc/h/ln
S	*59.4*	mph
D = v_p / S	*34.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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Appendix C – SR-210 Traffic Volume Summary, Traffic Counts and Volume Factors

SR-210 TRAFFIC VOLUME SUMMARY

Eastbound/Southbound

Location	Type	2007 PSR Existing AM	2007 PSR Existing PM	2012 Existing AM	2012 Existing PM	2020 No Build PP AM	2020 No Build PP PM	2020 Build PP AM	2020 Build PP PM	2040 No Build PP AM	2040 No Build PP PM	2040 Build PP AM	2040 Build PP PM
West of Arden Ave	Basic	3,170	4,026	**3,026**	**3,305**	3,600	3,840	3,830	4,230	5,040	5,190	5,270	5,580
Highland Ave	Off	938	993	864	786	890	810	820	700	960	850	890	740
--	Basic	2,232	3,033	2,162	2,519	2,710	3,030	3,010	3,530	4,080	4,340	4,380	4,840
Highland Ave	On	649	617	***598***	***488***	580	460	590	450	540	400	550	390
--	Basic	2,835	3,536	2,760	3,007	3,290	3,490	3,600	3,980	4,620	4,740	4,930	5,230
Victoria Ave	Off	0	0	0	0	200	210	330	460	680	750	810	1,000
--	Basic	2,835	3,536	2,760	3,007	3,090	3,280	3,270	3,520	3,940	3,990	4,120	4,230
Victoria Ave	On	0	0	0	0	60	90	100	280	230	300	270	490
--	Basic	2,835	3,536	2,760	3,007	3,150	3,370	3,370	3,800	4,170	4,290	4,390	4,720
SR-330	Off	390	767	361	287	400	340	410	390	480	460	490	510
--	Basic	2,445	2,769	**2,399**	**2,720**	2,750	3,030	2,960	3,410	3,690	3,830	3,900	4,210
SR-330	On	387	762	***380***	228	440	240	440	320	580	280	580	360
--	Basic	2,832	3,531	2,779	2,948	3,190	3,270	3,400	3,730	4,270	4,110	4,480	4,570
Baseline Rd	Off	416	416	252	***347***	390	370	340	510	740	440	690	580
--	Basic	2,416	3,115	2,526	2,601	2,800	2,900	3,060	3,220	3,530	3,670	3,790	3,990
Baseline Rd	On	786	897	***819***	554	850	570	900	630	940	600	990	660
--	Basic	3,210	4,004	**3,346**	**3,155**	3,650	3,470	3,960	3,850	4,470	4,270	4,780	4,650
5th St	Off	643	295	375	381	410	470	430	560	490	680	510	770
--	Basic	2,567	3,709	2,971	2,774	3,240	3,000	3,530	3,290	3,980	3,590	4,270	3,880
5th St	On	1,029	1,136	***1,032***	***820***	1,060	860	1,120	930	1,140	970	1,200	1,040
--	Basic	3,991	4,978	**4,003**	**3,594**	4,300	3,860	4,650	4,220	5,120	4,560	5,470	4,920
Lane Add	Basic	3,991	4,978	4,003	3,594	4,300	3,860	4,650	4,220	5,120	4,560	5,470	4,920
San Bernardino Ave	Off	805	928	568	614	610	650	650	680	710	740	750	770
--	Basic	3,186	4,050	3,435	2,980	3,690	3,210	4,000	3,540	4,410	3,820	4,720	4,150
Lane Add	Basic	3,186	4,050	**3,435**	**2,980**	3,690	3,210	4,000	3,540	4,410	3,820	4,720	4,150
San Bernardino Ave	On	588	645	***590***	***466***	680	530	680	480	920	710	920	660
To I-10	Basic	3,383	4,329	4,025	3,446	4,370	3,740	4,680	4,020	5,330	4,530	5,640	4,810

Westbound/Northbound

Location	Type	2007 PSR Existing AM	2007 PSR Existing PM	2012 Existing AM	2012 Existing PM	2020 No Build PP AM	2020 No Build PP PM	2020 Build PP AM	2020 Build PP PM	2040 No Build PP AM	2040 No Build PP PM	2040 Build PP AM	2040 Build PP PM
West of Arden Ave	Basic	*3,875*	*3,163*	**3,359**	**3,394**	3,870	4,020	4,250	4,570	5,150	5,500	5,530	6,050
Highland Ave	On	*841*	*796*	633	691	650	810	410	420	700	1,100	460	710
Lane Add	Basic	3,055	2,392	2,727	2,703	3,220	3,210	3,840	4,150	4,450	4,400	5,070	5,340
--	Basic	3,055	2,392	2,727	2,703	3,220	3,210	3,840	4,150	4,450	4,400	5,070	5,340
Highland Ave	Off	*391*	*502*	449	282	430	310	350	270	390	380	310	340
--	Basic	3,446	2,894	3,176	2,985	3,650	3,520	4,190	4,420	4,840	4,780	5,380	5,680
Victoria Ave	On	*0*	*0*	0	0	160	190	330	270	550	680	720	760
--	Basic	3,446	2,894	3,176	2,985	3,490	3,330	3,860	4,150	4,290	4,100	4,660	4,920
Victoria Ave	Off	*0*	*0*	0	0	90	50	210	190	310	190	430	330
--	Basic	*3,446*	*2,894*	3,176	2,985	3,580	3,380	4,070	4,340	4,600	4,290	5,090	5,250
SR-330	On	*320*	*801*	544	398	580	450	610	540	660	590	690	680
--	Basic	3,146	2,093	**2,632**	**2,587**	3,000	2,930	3,460	3,800	3,940	3,700	4,400	4,570
SR-330	Off	*314*	*796*	190	409	200	430	210	450	240	490	250	510
--	Basic	*3,460*	*2,889*	2,823	2,996	3,200	3,360	3,670	4,250	4,180	4,190	4,650	5,080
Baseline Rd	On	*348*	*494*	735	480	780	590	790	490	900	850	910	750
--	Basic	3,104	2,403	2,088	2,516	2,420	2,770	2,880	3,760	3,280	3,340	3,740	4,330
Baseline Rd	Off	*820*	*873*	***552***	522	560	530	580	630	600	570	620	670
--	Basic	*3,924*	*3,276*	**2,640**	**3,038**	2,980	3,300	3,460	4,390	3,880	3,910	4,360	5,000
5th St	On	*310*	*287*	***209***	***266***	210	280	270	450	220	300	280	470
--	Basic	4,076	3,464	2,431	2,772	2,770	3,020	3,190	3,940	3,660	3,610	4,080	4,530
5th St	Off	*802*	*608*	652	944	670	970	760	1,170	710	1,050	800	1,250
--	Basic	*4,878*	*4,072*	**3,083**	**3,716**	3,440	3,990	3,950	5,110	4,370	4,660	4,880	5,780
San Bernardino Ave	On	*579*	*911*	615	720	700	790	800	1,090	930	970	1,030	1,270
Lane Drop	Basic	3,833	2,652	2,469	2,995	2,740	3,200	3,150	4,020	3,440	3,690	3,850	4,510
--	Basic	3,833	2,652	**2,469**	**2,995**	2,740	3,200	3,150	4,020	3,440	3,690	3,850	4,510
San Bernardino Ave	Off	*301*	*689*	***194***	***778***	260	870	270	870	410	1,110	420	1,110
From I-10	Basic	*4,134*	*3,341*	2,663	3,774	3,000	4,070	3,420	4,890	3,850	4,800	4,270	5,620

AM Peak Period to Peak Hour	0.38
PM Peak Period to Peak Hour	0.28

xxxx = counts available
xxxx = based on PSR splits

SR-210 Freeway Mainline Average Peak Hour Count Summary
10/16-10/25/2012

PM	Name	EB		WB	
		AM	PM	AM	PM
26.25	.5 E/O Del R	3026	3305	3359	3394
28.7	330 JCT	2399	2720	2632	2587
30.1	0.7 EO Baseline	3346	3155	2640	3038
31.4	Santa Ana River	4003	3594	3083	3716
32.6	San Bernardino	3435	2980	2469	2995

SR-210 Freeway Mainline Average Peak Hour Count Summary
10/16-10/25/2012

PM	Name	EB		WB	
		AM	PM	AM	PM
26.25	.5 E/O Del R	3026	3305	3359	3394
28.7	330 JCT	2399	2720	2632	2587
30.1	0.7 EO Baseline	3346	3155	2640	3038
31.4	Santa Ana River	4003	3594	3083	3716
32.6	San Bernardino	3435	2980	2469	2995

									AM PEAK								PM PEAK						
DI	RTE	CO	PRE	PM	CS	LEG	YR	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH
06	198	TUL	R	4.796	610	A	11	W	2300	8.95	53.22	4.76	7	TUE	APR	E	2600	9.17	58.68	5.38	17	MON	OCT
06	198	TUL		7.76	668	B	11	W	2619	8.74	55.43	4.85	7	MON	APR	E	2950	10.06	54.26	5.46	17	WED	APR
06	198	TUL	R	8.753	133	B	11	W	2816	9.38	51.1	4.79	6	MON	MAR	E	3056	9.57	54.38	5.2	16	THU	DEC
06	198	TUL	R	19.76	18	A	11	W	428	8	74.96	6	7	TUE	OCT	W	390	7.93	68.91	5.47	18	SUN	JUL
06	198	TUL	R	19.76	115	B	11	W	533	10.14	74.03	7.51	6	THU	APR	W	807	12.58	90.37	11.37	19	MON	JAN
06	198	TUL		27.96	630	A	11	E	352	14.18	63.42	8.99	12	SUN	JUL	W	363	15.63	59.31	9.27	16	SUN	JUN
06	198	TUL		42.35	135	A	11	E	199	14.51	81.56	11.83	9	SAT	JUL	W	205	16.29	74.82	12.19	17	SUN	JUL
06	201	FRE		0	136	A	11	E	954	8.57	59.18	5.07	7	THU	FEB	E	1076	10.38	55.1	5.72	17	WED	NOV
06	201	TUL		1.4	654	A	11	E	254	8.48	54.86	4.65	7	WED	FEB	E	331	10.3	58.9	6.06	15	THU	FEB
06	201	TUL		13.97	27	B	11	W	96	11.81	84.21	9.95	5	MON	JUN	E	74	11.3	67.89	7.67	16	THU	DEC
06	201	TUL	L	13.98	26	A	11	W	221	9.14	55.95	5.12	7	WED	SEP	W	242	10.26	54.63	5.6	16	WED	SEP
06	201	TUL		23.96	137	B	11	E	105	12.53	69.54	8.71	6	MON	OCT	W	95	12.7	62.09	7.88	15	MON	OCT
06	202	KER	R	2.16	922	A	11	E	409	7.88	56.81	4.48	6	TUE	MAR	E	537	10.56	55.65	5.88	15	THU	MAR
06	202	KER		8.87	106	B	11	E	624	8.66	50.28	4.36	12	WED	NOV	W	781	8.51	64.07	5.45	18	TUE	APR
09	203	MNO	R	4.47	959	B	11	W	492	18.53	74.55	13.81	9	MON	MAY	E	511	17.86	80.35	14.35	15	SAT	NOV
09	203	MNO		4.782	107	A	10	E	634	12.47	52.48	6.54	10	SUN	DEC	E	856	15.19	58.15	8.83	15	THU	DEC
09	203	MNO		5.75	103	B	11	E	801	10.2	59.55	6.07	10	SUN	JUL	E	872	11.8	56.01	6.61	16	THU	DEC
09	203	MNO		6.866	108	B	11	E	611	14.29	65.07	9.3	11	SUN	JUL	W	526	14.31	55.96	8.01	13	FRI	AUG
09	203	MNO	R	8.56	921	B	10	E	699	12.17	72.29	8.79	10	SUN	AUG	E	642	10.75	75.18	8.08	14	SUN	MAR
06	204	KER		2.069	139	A	09	N	1631	7.84	64.59	5.06	7	THU	MAR	S	1541	9.12	52.49	4.79	16	FRI	DEC
06	204	KER		3.76	140	B	09	N	2360	7.37	78.3	5.77	3	FRI	JUN	N	2059	7.91	63.63	5.03	17	TUE	JUN
06	204	KER		6.258	204	B	09	S	2540	10.16	63.76	6.48	7	TUE	MAR	N	2072	10.26	51.52	5.28	17	THU	MAR
06	204	KER		6.752	141	B	09	S	1698	9.23	71.95	6.64	7	WED	DEC	S	1325	9.53	54.37	5.18	16	WED	DEC
10	205	SJ		1	8	B	10	W	5221	5.56	87.88	4.88	5	WED	JUN	E	5414	7.27	69.64	5.07	16	TUE	FEB
10	205	SJ	R	8.127	121	A	11	W	4741	5.32	83.04	4.42	5	MON	DEC	E	5025	7.62	61.49	4.68	16	FRI	JAN
08	210	SBD	R	31.72	857	A	11	E	4032	7.8	55.71	4.34	7	THU	NOV	W	3817	8	51.39	4.11	17	WED	APR
07	210	LA	R	3.57	527	O	10	E	5014	8.81	68.89	6.07	7	WED	JUN	W	4427	8.7	61.63	5.36	17	THU	OCT
07	210	LA	R	7.194	781	O	11	W	6554	9.89	57.13	5.65	10	FRI	OCT	W	6770	9.78	59.72	5.84	17	WED	MAY
07	210	LA	R	17.7	544	O	11	E	9320	8.24	68.09	5.61	7	TUE	MAY	W	10140	9.52	64.13	6.1	17	TUE	FEB
07	210	LA	R	35.24	194	A	09	W	9408	5.56	65.62	3.65	6	WED	OCT	E	10068	6.78	57.63	3.91	15	TUE	MAR
07	210	LA	R	51.85	495	B	11	W	6816	6.52	65.79	4.29	7	THU	FEB	E	7343	7.14	64.74	4.62	17	TUE	JUN
08	210	SBD		11.50	202	B	11	W	6379	7.21	56.85	4.1	8	MON	JAN	E	6678	7.66	55.98	4.29	15	FRI	APR
07	213	LA		5.085	245	B	10	N	1532	7.56	68.64	5.19	8	TUE	JAN	S	1349	8.14	56.12	4.57	17	TUE	OCT

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	107	2.6	47	100	124	3.2	53	100	74	2.1	54	100	305	2.6	51
06:30:00	134	3.2	48	100	152	3.8	55	100	128	3.3	58	100	414	3.4	54
06:45:00	185	4.4	48	100	184	4.5	56	100	126	3.3	58	100	495	4.1	54
07:00:00	246	5.7	49	100	222	5.3	57	100	145	3.9	57	100	613	5.0	54
1ht:	**672**				**682**				**473**				**1827**		
07:15:00	255	6.1	48	100	236	5.7	57	100	158	4.3	57	100	649	5.3	53
07:30:00	299	7.0	49	100	217	5.4	55	100	212	5.8	56	100	728	6.1	53
07:45:00	345	8.2	48	100	286	7.1	55	100	215	5.5	59	100	846	6.9	53
08:00:00	313	7.5	47	100	255	6.3	55	100	244	6.5	57	100	812	6.8	53
1ht:	**1212**				**994**				**829**				**3035**		
08:15:00	223	5.5	47	100	203	5.2	53	100	191	5.1	57	100	617	5.3	52
08:30:00	232	5.5	48	100	220	5.6	54	100	177	4.5	60	100	629	5.2	53
08:45:00	252	6.1	47	100	259	6.8	52	100	199	5.3	57	100	710	6.1	52
09:00:00	206	5.1	46	100	222	5.9	51	100	172	4.7	56	100	600	5.2	51
1ht:	**913**				**904**				**739**				**2556**		
09:15:00	163	4.0	47	100	203	5.5	50	100	161	4.2	59	100	527	4.6	52

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-16-2012 06:00:00** **TO:** **10-16-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	135	2.1	88	100	111	2.2	77	100	246	2.1	83
06:30:00	151	2.4	86	100	150	2.8	80	100	301	2.6	83
06:45:00	241	3.9	85	100	149	2.9	77	100	390	3.4	82
07:00:00	295	4.5	89	100	191	3.4	86	100	486	4.0	88
1ht:	**822**				**601**				**1423**		
07:15:00	338	5.3	88	100	220	4.1	83	100	558	4.7	86
07:30:00	330	5.1	88	100	234	4.3	82	100	564	4.7	86
07:45:00	408	6.6	84	100	284	5.6	77	100	692	6.1	81
08:00:00	368	5.8	86	100	272	5.2	79	100	640	5.5	83
1ht:	**1444**				**1010**				**2454**		
08:15:00	254	4.0	87	100	198	3.8	80	100	452	3.9	84
08:30:00	270	4.3	86	100	219	4.3	78	100	489	4.3	83
08:45:00	305	4.9	86	100	216	4.4	75	100	521	4.6	81
09:00:00	267	4.2	87	100	228	4.6	75	100	495	4.4	82
1ht:	**1096**				**861**				**1957**		
09:15:00	219	3.5	87	100	193	3.9	76	100	412	3.7	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	173	3.1	64	100	144	2.8	71	100	32	0.7	68	100	349	2.2	67
06:30:00	226	4.2	62	100	161	2.9	76	100	44	1.0	70	100	431	2.7	68
06:45:00	352	6.7	60	100	189	3.6	71	100	60	1.3	73	100	601	3.9	65
07:00:00	439	8.3	60	100	256	4.7	75	100	71	1.4	75	100	766	4.8	66
1ht:	**1190**				**750**				**207**				**2147**		
07:15:00	469	12.7	42	100	314	7.5	57	100	73	1.5	72	100	856	7.3	50
07:30:00	402	20.8	22	100	339	11.2	41	100	99	2.2	67	100	840	11.4	35
07:45:00	446	16.3	31	100	347	11.1	43	100	74	1.8	64	100	867	9.7	39
08:00:00	362	23.1	18	100	334	17.5	26	100	92	2.3	61	100	788	14.3	26
1ht:	**1679**				**1334**				**338**				**3351**		
08:15:00	365	10.4	40	100	269	6.5	57	100	63	1.4	67	100	697	6.1	49
08:30:00	345	6.4	61	100	229	4.4	71	100	61	1.3	70	100	635	4.1	66
08:45:00	373	7.1	60	100	243	4.8	69	100	54	1.3	65	100	670	4.4	63
09:00:00	377	7.1	60	100	233	4.7	68	100	70	1.7	62	100	680	4.5	63
1ht:	**1460**				**974**				**248**				**2682**		
09:15:00	302	5.6	61	100	222	4.4	70	100	59	1.4	65	100	583	3.8	65

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	168	3.4	69	100	244	4.1	91	100	412	3.7	82
06:30:00	220	4.3	70	100	321	5.3	92	100	541	4.8	83
06:45:00	261	5.1	70	100	422	7.1	90	100	683	6.1	82
07:00:00	381	7.4	71	100	525	8.9	90	100	906	8.1	82
1ht:	**1030**				**1512**				**2542**		
07:15:00	419	8.6	67	100	567	10.6	82	100	986	9.6	75
07:30:00	433	9.6	62	100	580	11.4	77	100	1013	10.5	71
07:45:00	439	9.8	61	100	557	11.0	77	100	996	10.4	70
08:00:00	426	9.3	63	100	541	10.7	77	100	967	10.0	71
1ht:	**1717**				**2245**				**3962**		
08:15:00	383	8.4	62	100	506	9.7	79	100	889	9.1	72
08:30:00	322	6.4	69	100	445	7.5	90	100	767	7.0	81
08:45:00	340	6.8	69	100	472	8.3	87	100	812	7.5	79
09:00:00	357	7.4	66	100	464	8.0	89	100	821	7.7	79
1ht:	**1402**				**1887**				**3289**		
09:15:00	269	5.4	68	100	388	6.5	91	100	657	6.0	81

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	87	1.5	67	100	86	1.7	58	100	118	2.1	75	100	114	2.2	79	100	405	1.9	71
06:30:00	102	1.8	66	100	87	1.7	58	100	146	2.5	80	100	156	2.9	81	100	491	2.2	73
06:45:00	140	2.3	69	100	93	1.8	60	100	198	3.5	78	100	161	3.1	79	100	592	2.7	73
07:00:00	188	3.1	68	100	123	2.2	63	100	245	4.2	80	100	206	3.8	82	100	762	3.3	75
1ht:	**517**				**389**				**707**				**637**				**2250**		
07:15:00	204	3.3	70	100	145	2.7	61	100	268	4.6	80	100	188	3.5	81	100	805	3.5	74
07:30:00	233	3.8	71	100	156	2.9	60	100	258	4.5	79	100	239	4.5	81	100	886	3.9	74
07:45:00	204	3.4	68	100	157	3.0	60	100	252	4.2	82	100	261	4.9	81	100	874	3.9	74
08:00:00	228	3.7	69	100	158	2.8	64	100	251	4.2	81	100	230	4.3	82	100	867	3.8	75
1ht:	**869**				**616**				**1029**				**918**				**3432**		
08:15:00	206	3.4	69	100	159	3.1	59	100	188	3.2	81	100	211	3.8	85	100	764	3.3	75
08:30:00	161	2.6	70	100	141	2.6	61	100	178	3.0	83	100	172	3.2	82	100	652	2.9	74
08:45:00	182	3.0	68	100	138	2.6	60	100	193	3.3	81	100	176	3.3	82	100	689	3.1	74
09:00:00	167	2.8	68	100	160	3.1	58	100	176	3.0	81	100	192	3.7	78	100	695	3.2	72
1ht:	**716**				**598**				**735**				**751**				**2800**		
09:15:00	161	2.8	66	100	126	2.4	59	100	140	2.4	80	100	139	2.6	81	100	566	2.6	72

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	111	2.8	45	100	125	3.2	54	100	81	2.3	55	100	317	2.7	51
06:30:00	130	3.2	47	100	141	3.5	55	100	123	3.1	60	100	394	3.3	54
06:45:00	202	4.8	48	100	207	5.2	54	100	140	3.7	57	100	549	4.6	53
07:00:00	267	6.3	48	100	232	5.7	56	100	156	4.2	57	100	655	5.4	53
1ht:	**710**				**705**				**500**				**1915**		
07:15:00	244	5.7	49	100	212	5.2	56	100	168	4.3	59	100	624	5.1	54
07:30:00	268	6.3	48	100	230	5.6	56	100	227	6.1	57	100	725	6.0	54
07:45:00	343	8.4	47	100	255	6.3	55	100	231	6.1	58	100	829	6.9	52
08:00:00	329	7.9	48	100	256	6.6	53	100	230	6.1	58	100	815	6.8	52
1ht:	**1184**				**953**				**856**				**2993**		
08:15:00	220	5.3	47	100	210	5.4	53	100	198	5.2	58	100	628	5.3	53
08:30:00	246	6.0	47	100	223	5.8	53	100	171	4.5	58	100	640	5.4	52
08:45:00	237	5.7	48	100	230	5.7	55	100	188	5.0	57	100	655	5.5	53
09:00:00	261	6.1	49	100	239	5.8	56	100	184	4.9	58	100	684	5.6	54
1ht:	**964**				**902**				**741**				**2607**		
09:15:00	173	4.1	48	100	216	5.8	51	100	151	3.8	61	100	540	4.6	53

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-17-2012 06:00:00** **TO:** **10-17-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	135	2.1	88	100	121	2.3	80	100	256	2.2	84
06:30:00	150	2.4	86	100	125	2.5	75	100	275	2.5	81
06:45:00	242	3.8	87	100	156	3.3	72	100	398	3.5	81
07:00:00	310	5.0	85	100	201	3.8	80	100	511	4.4	83
1ht:	**837**				**603**				**1440**		
07:15:00	330	5.0	90	100	205	3.9	81	100	535	4.4	86
07:30:00	333	5.2	88	100	230	4.5	77	100	563	4.9	84
07:45:00	378	6.0	86	100	268	5.4	76	100	646	5.7	82
08:00:00	349	5.4	88	100	260	5.2	76	100	609	5.3	83
1ht:	**1390**				**963**				**2353**		
08:15:00	251	3.9	88	100	186	3.7	77	100	437	3.8	83
08:30:00	315	4.8	89	100	218	4.4	76	100	533	4.6	84
08:45:00	262	4.0	89	100	243	4.8	76	100	505	4.4	83
09:00:00	295	4.7	86	100	245	5.1	74	100	540	4.9	81
1ht:	**1123**				**892**				**2015**		
09:15:00	214	3.4	87	100	206	4.2	75	100	420	3.8	81

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	206	3.7	63	100	146	2.7	73	100	33	0.7	76	100	385	2.4	68
06:30:00	207	3.8	62	100	168	3.2	71	100	29	0.6	75	100	404	2.5	67
06:45:00	349	6.6	61	100	207	4.0	70	100	53	1.2	66	100	609	3.9	64
07:00:00	440	8.3	61	100	243	4.6	73	100	71	1.5	71	100	754	4.8	66
1ht:	**1202**				**764**				**186**				**2152**		
07:15:00	508	10.3	56	100	310	6.1	70	100	60	1.2	77	100	878	5.9	62
07:30:00	421	17.8	27	100	335	10.0	46	100	74	1.7	67	100	830	9.8	38
07:45:00	417	15.4	31	100	336	10.0	46	100	78	1.9	62	100	831	9.1	40
08:00:00	378	24.2	18	100	327	13.4	33	100	99	2.5	60	100	804	13.4	29
1ht:	**1724**				**1308**				**311**				**3343**		
08:15:00	336	7.0	54	100	222	4.8	63	100	64	1.5	67	100	622	4.4	59
08:30:00	366	6.6	63	100	231	4.4	72	100	64	1.4	72	100	661	4.1	67
08:45:00	379	7.1	61	100	255	4.9	71	100	67	1.5	68	100	701	4.5	65
09:00:00	350	6.5	62	100	226	4.6	68	100	73	1.9	57	100	649	4.3	63
1ht:	**1431**				**934**				**268**				**2633**		
09:15:00	273	4.9	64	100	221	4.5	67	100	56	1.3	65	100	550	3.6	65

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	187	3.7	69	100	260	4.3	93	100	447	4.0	83
06:30:00	208	4.2	68	100	307	5.2	89	100	515	4.7	81
06:45:00	272	5.6	67	100	403	6.9	89	100	675	6.2	80
07:00:00	387	7.8	68	100	538	9.3	88	100	925	8.6	80
1ht:	**1054**				**1508**				**2562**		
07:15:00	462	9.7	65	100	569	10.1	85	100	1031	9.9	76
07:30:00	430	9.3	63	100	589	11.1	81	100	1019	10.2	73
07:45:00	434	9.6	62	100	561	10.8	79	100	995	10.2	72
08:00:00	440	9.8	61	100	559	10.7	79	100	999	10.3	72
1ht:	**1766**				**2278**				**4044**		
08:15:00	343	7.6	62	100	461	8.4	83	100	804	8.0	74
08:30:00	311	6.5	65	100	494	8.4	89	100	805	7.5	80
08:45:00	342	7.2	65	100	519	9.2	86	100	861	8.2	78
09:00:00	316	6.7	64	100	477	8.0	91	100	793	7.4	80
1ht:	**1312**				**1951**				**3263**		
09:15:00	280	5.8	66	100	370	6.1	93	100	650	5.9	81

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	92	1.6	66	100	78	1.5	59	100	122	2.1	79	100	115	2.1	82	100	407	1.8	73
06:30:00	110	1.9	67	100	92	1.8	59	100	156	2.7	79	100	142	2.7	81	100	500	2.3	73
06:45:00	151	2.5	68	100	107	2.1	58	100	194	3.4	78	100	150	2.9	79	100	602	2.7	72
07:00:00	207	3.3	71	100	126	2.3	62	100	255	4.5	78	100	183	3.4	82	100	771	3.4	75
1ht:	**560**				**403**				**727**				**590**				**2280**		
07:15:00	209	3.5	69	90	127	2.3	62	90	242	4.4	76	90	179	3.5	77	90	757	3.4	72
07:30:00	213	3.4	71	100	148	2.8	61	100	278	4.9	78	100	242	4.6	80	100	881	3.9	74
07:45:00	185	3.1	69	100	152	2.8	61	100	282	5.0	78	100	259	4.8	81	100	878	3.9	74
08:00:00	211	3.6	68	100	185	3.4	62	100	240	4.1	80	100	251	4.5	85	100	887	3.9	75
1ht:	**817A**				**614A**				**1044A**				**936A**				**3411**		
08:15:00	188	3.1	68	100	165	3.1	60	100	188	3.2	79	100	170	3.1	82	100	711	3.2	73
08:30:00	186	3.1	68	100	146	2.9	58	100	176	3.0	80	100	195	3.8	78	100	703	3.2	72
08:45:00	188	3.2	67	77	155	3.1	58	77	166	2.9	78	77	164	3.1	81	77	673	3.1	71
09:00:00	186	3.0	70	100	154	2.9	62	100	157	2.7	79	100	173	3.2	81	100	670	3.0	73
1ht:	**748A**				**620A**				**688A**				**705A**				**2761**		
09:15:00	156	2.5	70	100	132	2.6	58	100	128	2.3	77	100	151	2.8	81	100	567	2.6	72

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-18-2012 06:00:00** **TO:** **10-18-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	103	2.6	45	100	129	3.3	54	100	93	2.4	60	100	325	2.8	53
06:30:00	151	3.6	47	100	170	4.3	54	100	129	3.3	59	100	450	3.8	53
06:45:00	198	4.7	48	100	203	5.0	56	100	118	3.2	56	100	519	4.3	53
07:00:00	265	6.2	49	100	237	5.6	58	100	141	3.8	56	100	643	5.2	54
1ht:	**717**				**739**				**481**				**1937**		
07:15:00	276	6.6	48	100	227	5.5	57	100	175	4.7	56	100	678	5.6	53
07:30:00	263	6.2	48	100	239	5.7	58	100	225	6.0	57	100	727	6.0	54
07:45:00	364	8.6	48	100	255	6.3	55	100	236	6.2	57	100	855	7.1	53
08:00:00	295	7.1	48	100	243	6.0	55	100	248	6.8	56	100	786	6.6	52
1ht:	**1198**				**964**				**884**				**3046**		
08:15:00	230	5.5	48	100	236	6.0	54	100	171	4.6	57	100	637	5.4	52
08:30:00	232	5.5	48	100	242	6.2	54	100	180	5.0	55	100	654	5.5	52
08:45:00	251	6.1	47	100	233	6.1	52	100	175	5.0	54	100	659	5.7	51
09:00:00	226	5.4	48	100	243	6.6	50	100	170	4.6	56	100	639	5.5	51
1ht:	**939**				**954**				**696**				**2589**		
09:15:00	188	4.7	45	100	228	6.2	51	100	173	4.8	55	100	589	5.2	50

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-18-2012 06:00:00** **TO:** **10-18-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	127	2.0	87	100	111	2.3	74	100	238	2.1	81
06:30:00	178	2.8	88	100	145	3.0	73	100	323	2.9	81
06:45:00	242	3.8	87	100	164	3.3	75	100	406	3.6	82
07:00:00	327	5.1	88	100	203	3.9	80	100	530	4.5	85
1ht:	**874**				**623**				**1497**		
07:15:00	346	5.4	88	100	215	4.2	78	100	561	4.8	84
07:30:00	323	5.0	89	100	237	4.7	77	100	560	4.8	84
07:45:00	394	6.3	86	100	275	5.7	74	100	669	6.0	81
08:00:00	354	5.5	88	100	246	4.8	77	100	600	5.2	84
1ht:	**1417**				**973**				**2390**		
08:15:00	276	4.3	87	100	213	4.2	77	100	489	4.3	83
08:30:00	294	4.5	89	100	234	4.7	76	100	528	4.6	83
08:45:00	289	4.5	87	100	233	4.8	74	100	522	4.7	81
09:00:00	288	4.4	89	100	240	5.0	74	100	528	4.7	82
1ht:	**1147**				**920**				**2067**		
09:15:00	222	3.5	87	100	198	4.0	75	100	420	3.8	81

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	179	3.2	64	100	134	2.6	72	100	41	0.8	78	100	354	2.2	68
06:30:00	236	4.5	60	100	170	3.3	70	100	46	1.0	71	100	452	2.9	65
06:45:00	328	6.3	60	100	206	4.0	71	100	61	1.4	67	100	595	3.9	64
07:00:00	490	9.2	61	100	249	4.8	71	100	87	1.9	71	100	826	5.3	65
1ht:	**1233**				**759**				**235**				**2227**		
07:15:00	479	11.7	47	100	320	7.5	58	100	70	1.6	67	100	869	6.9	53
07:30:00	400	16.7	27	100	328	10.7	42	100	91	2.2	64	100	819	9.8	37
07:45:00	424	16.0	30	100	314	9.8	44	100	91	2.2	63	100	829	9.3	39
08:00:00	405	17.5	26	100	322	10.3	43	100	94	2.3	61	100	821	10.0	37
1ht:	**1708**				**1284**				**346**				**3338**		
08:15:00	371	7.1	59	100	249	4.9	70	100	50	1.1	70	100	670	4.4	64
08:30:00	367	6.8	62	100	242	4.8	69	100	52	1.2	68	100	661	4.3	65
08:45:00	414	7.9	60	100	253	5.3	66	100	51	1.1	70	100	718	4.7	63
09:00:00	391	7.2	62	100	274	5.5	69	100	65	1.6	62	100	730	4.7	65
1ht:	**1543**				**1018**				**218**				**2779**		
09:15:00	292	5.5	61	100	216	4.3	69	100	57	1.4	63	100	565	3.7	64

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	164	3.2	70	100	245	4.2	89	100	409	3.7	81
06:30:00	205	4.5	62	100	329	5.9	85	100	534	5.2	76
06:45:00	276	5.6	67	100	422	7.5	86	100	698	6.6	78
07:00:00	389	8.3	64	100	575	10.6	83	100	964	9.4	75
1ht:	**1034**				**1571**				**2605**		
07:15:00	462	10.9	58	100	556	11.3	75	100	1018	11.1	67
07:30:00	440	9.9	61	100	567	11.4	76	100	1007	10.6	69
07:45:00	416	9.3	61	100	553	11.0	77	100	969	10.1	70
08:00:00	444	10.2	59	100	566	11.2	77	100	1010	10.7	69
1ht:	**1762**				**2242**				**4004**		
08:15:00	349	7.6	63	100	504	9.3	83	100	853	8.4	75
08:30:00	323	6.6	67	100	499	8.5	89	100	822	7.6	80
08:45:00	335	7.2	64	100	492	8.7	86	100	827	7.9	77
09:00:00	336	7.2	64	100	503	8.9	86	100	839	8.0	77
1ht:	**1343**				**1998**				**3341**		
09:15:00	293	6.2	64	100	390	6.7	88	100	683	6.5	78

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	90	1.6	66	100	95	1.9	58	100	111	1.9	79	100	119	2.1	85	100	415	1.9	73
06:30:00	111	1.9	66	100	92	1.8	58	100	160	2.8	77	100	133	2.6	77	100	496	2.3	71
06:45:00	132	2.3	66	97	110	2.1	59	97	207	3.7	76	97	142	2.7	80	97	591	2.7	72
07:00:00	212	3.4	71	100	143	2.6	62	100	243	4.2	79	100	187	3.5	82	100	785	3.4	75
1ht:	**546A**				**440A**				**720A**				**581A**				**2287**		
07:15:00	214	3.6	69	100	150	2.8	61	100	233	4.1	78	100	195	3.7	80	100	792	3.5	73
07:30:00	220	3.6	70	100	160	3.0	60	100	265	4.5	80	100	252	4.7	82	100	897	4.0	75
07:45:00	217	3.5	70	100	164	3.1	60	100	271	4.6	80	100	258	4.9	81	100	910	4.0	74
08:00:00	218	3.5	72	100	171	3.1	63	100	247	4.2	80	100	236	4.3	83	100	872	3.8	75
1ht:	**869**				**645**				**1016**				**941**				**3471**		
08:15:00	193	3.1	70	100	156	3.0	60	100	201	3.5	78	100	177	3.3	81	100	727	3.2	73
08:30:00	209	3.4	71	100	161	3.0	61	100	196	3.3	81	100	189	3.7	79	100	755	3.3	73
08:45:00	193	3.4	66	100	155	3.1	57	100	179	3.2	77	100	165	3.2	79	100	692	3.2	70
09:00:00	187	3.1	70	100	157	3.1	58	100	167	2.8	82	100	170	3.2	80	100	681	3.0	73
1ht:	**782**				**629**				**743**				**701**				**2855**		
09:15:00	153	2.6	66	100	148	2.9	57	100	129	2.2	79	100	145	2.7	81	100	575	2.6	70

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	110	2.8	45	100	139	3.5	55	100	79	2.1	57	100	328	2.8	52
06:30:00	136	3.3	47	100	163	4.0	55	100	128	3.4	58	100	427	3.6	53
06:45:00	198	4.8	47	100	198	4.8	56	100	132	3.6	57	100	528	4.4	53
07:00:00	248	5.9	48	100	236	5.6	58	100	152	3.9	59	100	636	5.1	54
1ht:	**692**				**736**				**491**				**1919**		
07:15:00	228	5.5	47	100	226	5.3	59	100	160	4.2	57	100	614	5.0	54
07:30:00	254	5.9	49	100	243	5.9	57	100	200	5.3	58	100	697	5.7	54
07:45:00	338	8.1	48	100	265	6.2	58	100	219	5.8	57	100	822	6.7	54
08:00:00	287	6.8	48	100	234	5.5	59	100	257	6.9	57	100	778	6.4	54
1ht:	**1107**				**968**				**836**				**2911**		
08:15:00	219	5.2	48	100	227	5.5	56	100	172	4.7	56	100	618	5.1	53
08:30:00	200	4.7	49	97	223	5.4	57	97	177	4.8	56	97	600	4.9	54
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	212	5.1	47	97	218	5.5	54	97	193	5.3	56	97	623	5.3	52
1ht:	**841A**				**892A**				**723A**				**2456**		
09:15:00	184	4.5	46	100	181	4.7	53	100	181	4.9	56	100	546	4.7	52

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-23-2012 06:00:00** **TO:** **10-23-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	137	2.2	84	100	108	2.2	74	100	245	2.2	80
06:30:00	164	2.7	84	100	146	2.9	77	100	310	2.8	81
06:45:00	239	3.8	87	100	152	3.0	78	100	391	3.4	84
07:00:00	298	4.6	88	100	204	3.8	81	100	502	4.2	85
1ht:	**838**				**610**				**1448**		
07:15:00	321	4.9	89	100	211	3.9	83	100	532	4.4	87
07:30:00	341	5.4	86	100	233	4.5	80	100	574	4.9	84
07:45:00	379	6.0	86	100	267	5.3	77	100	646	5.7	82
08:00:00	354	5.5	88	100	233	4.3	82	100	587	4.9	85
1ht:	**1395**				**944**				**2339**		
08:15:00	234	3.7	87	100	194	3.7	79	100	428	3.7	83
08:30:00	267	4.1	90	100	217	4.2	78	100	484	4.1	85
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	248	4.1	82	97	214	4.4	73	97	462	4.3	78
1ht:	**999A**				**833A**				**1832**		
09:15:00	237	3.8	84	100	181	3.7	74	100	418	3.8	80

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	189	3.4	64	100	137	2.7	70	100	35	0.7	78	100	361	2.2	68
06:30:00	229	4.1	64	100	164	3.2	71	100	48	1.0	73	100	441	2.8	67
06:45:00	326	6.0	62	100	208	4.0	71	100	40	0.8	73	100	574	3.6	66
07:00:00	414	7.8	60	100	265	5.2	70	100	79	1.6	73	100	758	4.9	65
1ht:	**1158**				**774**				**202**				**2134**		
07:15:00	498	9.7	58	100	299	6.0	69	100	55	1.2	71	100	852	5.6	63
07:30:00	394	17.9	25	100	349	13.5	35	100	82	1.9	65	100	825	11.1	33
07:45:00	438	12.5	40	100	301	7.8	53	100	94	2.2	66	100	833	7.5	47
08:00:00	388	13.5	33	100	314	9.1	47	100	86	2.0	66	100	788	8.2	42
1ht:	**1718**				**1263**				**317**				**3298**		
08:15:00	341	6.1	64	100	224	4.3	71	100	55	1.2	71	100	620	3.9	67
08:30:00	355	6.3	64	97	224	4.5	68	97	42	0.9	75	97	621	3.9	66
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	362	7.0	59	97	230	4.7	67	97	73	1.6	68	97	665	4.4	63
1ht:	**1410A**				**904A**				**228A**				**2542**		
09:15:00	303	5.7	61	100	212	4.2	70	100	73	1.9	59	100	588	3.9	64

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	157	3.2	68	100	255	4.3	89	100	412	3.7	81
06:30:00	210	4.1	69	100	309	5.3	89	100	519	4.7	81
06:45:00	272	5.4	69	100	422	7.2	89	100	694	6.3	81
07:00:00	377	7.7	67	100	500	8.7	87	100	877	8.2	79
1ht:	**1016**				**1486**				**2502**		
07:15:00	434	9.0	66	100	562	10.1	84	100	996	9.6	76
07:30:00	432	9.5	63	100	535	10.5	77	100	967	10.0	71
07:45:00	434	9.5	63	100	585	11.2	79	100	1019	10.4	72
08:00:00	444	9.5	64	100	557	11.1	77	100	1001	10.3	71
1ht:	**1744**				**2239**				**3983**		
08:15:00	313	6.1	70	100	470	8.0	90	100	783	7.0	82
08:30:00	337	7.0	66	100	507	8.8	88	100	844	7.9	79
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	317	6.5	67	97	466	8.4	85	97	783	7.4	77
1ht:	**1289A**				**1924A**				**3213**		
09:15:00	268	5.5	67	100	387	6.8	86	100	655	6.2	78

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	93	1.6	67	100	77	1.6	55	100	122	2.1	78	100	103	1.9	82	100	395	1.8	72
06:30:00	106	1.8	66	100	95	1.8	61	100	128	2.2	79	100	136	2.6	80	100	465	2.1	72
06:45:00	143	2.5	64	100	115	2.2	59	100	208	3.6	80	100	172	3.3	80	100	638	2.9	73
07:00:00	177	3.0	68	100	129	2.5	59	100	229	3.8	83	100	196	3.8	78	100	731	3.3	74
1ht:	**519**				**416**				**687**				**607**				**2229**		
07:15:00	184	3.1	69	100	149	2.7	64	100	245	4.2	80	100	202	3.8	81	100	780	3.4	74
07:30:00	210	3.6	66	100	133	2.4	63	100	281	4.9	78	100	222	4.3	78	100	846	3.8	73
07:45:00	216	3.7	66	100	168	3.2	60	100	268	4.6	79	100	245	4.7	80	100	897	4.1	73
08:00:00	241	4.0	68	100	184	3.3	65	100	229	3.8	82	100	228	4.3	82	100	882	3.8	74
1ht:	**851**				**634**				**1023**				**897**				**3405**		
08:15:00	159	2.7	68	100	140	2.5	63	100	188	3.1	84	100	181	3.4	82	100	668	2.9	75
08:30:00	195	3.3	68	100	154	3.0	59	100	199	3.4	81	100	202	3.9	79	100	750	3.4	73
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	122	2.3	62	47	120	2.4	57	47	133	2.6	71	47	129	2.9	69	47	504	2.5	65
1ht:	**666A**				**568A**				**728A**				**718A**				**2680**		
09:15:00	114	2.2	60	83	115	2.4	54	83	89	1.7	72	83	103	2.2	72	83	421	2.1	64

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-24-2012 06:00:00** **TO:** **10-24-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	107	2.7	45	100	135	3.3	56	100	85	2.3	56	100	327	2.8	52
06:30:00	124	3.0	47	83	146	3.7	54	83	120	3.4	54	83	390	3.3	52
06:45:00	171	4.1	48	100	181	4.4	56	100	136	3.6	57	100	488	4.0	53
07:00:00	272	6.5	48	100	217	5.4	55	100	137	3.8	54	100	626	5.3	52
1ht:	**681A**				**683A**				**478A**				**1842**		
07:15:00	233	5.8	46	100	217	5.3	57	100	165	4.5	55	100	615	5.2	52
07:30:00	222	5.5	46	93	182	4.4	57	93	189	5.2	56	93	593	5.0	53
07:45:00	291	7.3	46	90	213	5.1	57	90	167	4.5	56	90	671	5.6	52
08:00:00	286	6.9	47	97	243	5.8	58	97	210	5.7	56	97	739	6.1	53
1ht:	**1029A**				**857A**				**731A**				**2617**		
08:15:00	175	4.3	46	93	153	3.7	57	93	137	3.6	57	93	465	3.9	53
08:30:00	175	4.2	47	73	200	4.7	58	73	142	3.8	57	73	517	4.2	54
08:45:00	193	4.8	46	93	210	4.9	58	93	179	4.9	56	93	582	4.9	54
09:00:00	251	6.1	47	100	237	5.6	58	100	162	4.4	56	100	650	5.4	53
1ht:	**802A**				**803A**				**623A**				**2228**		
09:15:00	164	3.9	48	97	187	4.5	57	97	148	4.0	57	97	499	4.1	54

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
08:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-24-2012 06:00:00** **TO:** **10-24-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	122	1.9	87	100	119	2.4	77	100	241	2.1	82
06:30:00	171	2.8	84	93	135	2.8	73	93	306	2.8	79
06:45:00	212	3.3	87	100	158	3.0	81	100	370	3.2	84
07:00:00	320	5.1	85	100	191	3.9	75	100	511	4.5	82
1ht:	**828A**				**604A**				**1432**		
07:15:00	330	5.2	86	100	209	3.9	81	100	539	4.6	84
07:30:00	318	5.1	86	100	218	4.3	78	100	536	4.7	83
07:45:00	362	5.8	86	97	278	5.3	81	97	640	5.5	83
08:00:00	355	5.6	87	100	258	4.9	80	100	613	5.2	84
1ht:	**1364A**				**962A**				**2326**		
08:15:00	275	4.3	88	97	186	3.6	79	97	461	3.9	85
08:30:00	264	4.1	89	90	232	4.5	79	90	496	4.3	84
08:45:00	260	4.1	88	97	221	4.3	79	97	481	4.2	84
09:00:00	304	4.8	87	100	252	5.0	77	100	556	4.9	83
1ht:	**1105A**				**892A**				**1997**		
09:15:00	213	3.3	88	100	202	4.1	76	100	415	3.7	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	164	3.0	63	100	139	2.7	72	100	39	0.8	78	100	342	2.1	68
06:30:00	188	3.5	61	90	137	2.7	70	90	49	1.1	70	90	374	2.4	65
06:45:00	332	6.4	59	100	200	4.0	69	100	57	1.2	70	100	589	3.9	64
07:00:00	421	8.2	59	100	241	4.9	67	100	66	1.4	70	100	728	4.8	63
1ht:	**1114A**				**721A**				**211A**				**2046**		
07:15:00	507	10.9	53	100	302	6.1	68	100	65	1.4	71	100	874	6.1	59
07:30:00	396	21.3	21	100	325	10.5	42	100	79	1.8	67	100	800	11.2	34
07:45:00	351	16.8	24	87	263	8.0	45	87	80	1.8	66	87	694	8.9	37
08:00:00	373	14.1	30	93	299	10.0	41	93	90	2.0	68	93	762	8.7	39
1ht:	**1637A**				**1194A**				**313A**				**3144**		
08:15:00	339	6.2	62	97	216	4.2	70	97	42	0.8	77	97	597	3.8	66
08:30:00	287	5.5	60	77	210	4.1	71	77	42	0.8	76	77	539	3.5	65
08:45:00	327	6.0	62	97	223	4.5	69	97	60	1.2	74	97	610	3.9	66
09:00:00	365	6.9	61	100	240	4.6	72	100	84	2.0	63	100	689	4.5	65
1ht:	**1329A**				**893A**				**232A**				**2454**		
09:15:00	289	5.2	63	100	218	4.3	70	100	51	1.1	71	100	558	3.5	66

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	166	3.3	68	100	251	4.4	87	100	417	3.9	79
06:30:00	211	4.3	67	93	289	4.8	92	93	500	4.6	81
06:45:00	271	5.4	68	100	411	7.1	88	100	682	6.3	80
07:00:00	369	7.8	65	100	524	9.7	82	100	893	8.7	75
1ht:	**1020A**				**1481A**				**2501**		
07:15:00	433	8.9	67	100	559	10.4	82	100	992	9.6	75
07:30:00	442	9.8	62	100	585	11.9	75	100	1027	10.8	69
07:45:00	417	9.0	64	97	547	10.8	77	97	964	9.9	71
08:00:00	437	9.7	62	100	564	11.2	77	100	1001	10.4	70
1ht:	**1729A**				**2256A**				**3985**		
08:15:00	346	7.1	67	97	483	8.7	85	97	829	7.9	77
08:30:00	332	6.8	67	90	472	8.4	86	90	804	7.6	78
08:45:00	329	6.6	68	97	469	8.3	86	97	798	7.5	78
09:00:00	352	7.0	69	100	480	8.5	86	100	832	7.7	79
1ht:	**1360A**				**1904A**				**3264**		
09:15:00	269	5.4	68	100	386	6.6	89	100	655	6.0	80

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	82	1.5	64	100	83	1.7	55	100	111	1.9	78	100	106	2.1	78	100	382	1.8	70
06:30:00	109	1.9	66	93	81	1.7	56	93	145	2.6	77	93	125	2.5	77	93	460	2.1	71
06:45:00	118	2.1	64	100	108	2.1	59	100	204	3.6	78	100	167	3.2	79	100	597	2.7	72
07:00:00	184	3.2	65	100	145	2.9	57	100	235	4.1	79	100	184	3.6	77	100	748	3.4	71
1ht:	**494A**				**419A**				**697A**				**584A**				**2194**		
07:15:00	208	3.6	67	100	152	2.9	59	100	258	4.6	77	100	197	3.9	77	100	815	3.7	71
07:30:00	227	3.9	67	100	147	2.8	61	100	291	5.0	80	100	242	4.8	77	100	907	4.1	73
07:45:00	191	3.3	66	97	157	2.8	64	97	234	4.1	78	97	237	4.6	78	97	819	3.7	72
08:00:00	226	3.9	66	100	182	3.3	62	100	250	4.3	80	100	221	4.5	75	100	879	4.0	71
1ht:	**853A**				**638A**				**1034A**				**896A**				**3421**		
08:15:00	170	3.1	62	87	151	2.9	59	87	175	3.0	79	87	186	3.8	75	87	682	3.2	69
08:30:00	184	3.1	68	90	152	3.0	58	90	184	3.2	79	90	189	3.8	77	90	709	3.3	71
08:45:00	180	3.0	68	97	151	2.8	61	97	159	2.9	76	97	173	3.4	77	97	663	3.0	71
09:00:00	188	3.4	63	93	141	2.8	57	93	145	2.8	71	93	155	3.3	72	93	629	3.1	66
1ht:	**722A**				**596A**				**662A**				**701A**				**2681**		
09:15:00	163	2.8	68	100	138	2.7	59	100	140	2.3	82	100	145	2.8	78	100	586	2.6	72

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	80	2.1	43	93	99	2.4	55	93	75	2.3	50	93	254	2.3	50
06:30:00	113	2.8	46	80	136	3.3	56	80	108	3.0	54	80	357	3.0	52
06:45:00	144	3.7	45	93	135	3.4	54	93	105	2.8	56	93	384	3.3	51
07:00:00	232	5.8	46	100	204	5.0	55	100	128	3.4	58	100	564	4.7	52
1ht:	**579A**				**579A**				**417A**				**1575**		
07:15:00	211	5.2	46	83	206	5.1	56	83	131	3.5	57	83	548	4.6	52
07:30:00	126	3.1	46	53	114	2.7	58	53	101	2.8	56	53	341	2.9	53
07:45:00	257	6.4	46	93	216	5.1	58	93	188	5.2	55	93	661	5.5	53
08:00:00	155	3.8	47	67	135	3.1	59	67	143	3.8	57	67	433	3.6	54
1ht:	**790A**				**708A**				**584A**				**2082**		
08:15:00	172	4.2	47	90	161	3.8	58	90	147	3.9	57	90	480	4.0	54
08:30:00	152	3.7	47	90	144	3.4	59	90	140	3.7	58	90	436	3.6	54
08:45:00	169	4.0	48	83	186	4.3	59	83	145	3.8	59	83	500	4.0	55
09:00:00	184	4.4	48	73	170	4.3	55	73	170	4.6	57	73	524	4.4	53
1ht:	**675A**				**659A**				**599A**				**1933**		
09:15:00	141	3.4	47	87	130	3.4	53	87	112	3.1	54	87	383	3.3	51

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
07:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-25-2012 06:00:00** **TO:** **10-25-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	123	1.9	90	100	104	2.2	73	100	227	2.0	82
06:30:00	162	2.5	89	90	137	2.7	77	90	299	2.6	83
06:45:00	232	3.5	90	100	149	2.9	77	100	381	3.2	85
07:00:00	285	4.5	88	100	198	3.9	77	100	483	4.2	83
1ht:	**806A**				**589A**				**1395**		
07:15:00	362	5.7	87	93	191	3.8	76	93	553	4.7	83
07:30:00	302	4.6	90	90	220	4.3	78	90	522	4.5	85
07:45:00	374	5.9	87	97	281	5.7	75	97	655	5.8	82
08:00:00	337	5.2	89	90	267	5.1	79	90	604	5.1	85
1ht:	**1378A**				**960A**				**2338**		
08:15:00	241	3.7	89	97	199	3.8	79	97	440	3.8	85
08:30:00	258	3.9	91	100	199	3.8	79	100	457	3.9	86
08:45:00	263	4.1	89	100	219	4.3	78	100	482	4.2	84
09:00:00	277	4.3	87	90	201	4.1	74	90	478	4.2	82
1ht:	**1038A**				**818A**				**1856**		
09:15:00	228	3.6	87	97	183	3.7	75	97	411	3.7	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	96	1.7	64	67	83	1.6	72	67	35	0.7	81	67	214	1.3	70
06:30:00	184	3.3	63	70	107	2.2	67	70	34	0.7	79	70	325	2.1	66
06:45:00	305	5.6	62	97	186	3.6	72	97	35	0.7	72	97	526	3.3	66
07:00:00	299	5.6	61	87	186	3.7	68	87	61	1.3	70	87	546	3.6	64
1ht:	**934A**				**589A**				**168A**				**1691**		
07:15:00	302	7.1	49	50	178	4.0	61	50	40	0.8	72	50	520	4.0	55
07:30:00	163	4.6	41	47	126	3.4	51	47	21	0.5	72	47	310	2.8	47
07:45:00	391	10.8	41	90	291	7.6	52	90	62	1.4	68	90	744	6.6	48
08:00:00	285	10.7	30	80	234	7.3	44	80	76	1.7	68	80	595	6.6	41
1ht:	**1211A**				**896A**				**221A**				**2328**		
08:15:00	259	4.7	63	80	184	3.6	70	80	46	1.0	69	80	489	3.1	66
08:30:00	271	4.9	63	77	203	4.0	70	77	39	0.8	77	77	513	3.2	67
08:45:00	304	5.6	62	83	205	3.9	72	83	50	1.1	73	83	559	3.5	67
09:00:00	314	5.9	61	80	179	3.6	68	80	56	1.4	59	80	549	3.6	63
1ht:	**1149A**				**771A**				**193A**				**2113**		
09:15:00	242	4.3	64	67	158	3.1	69	67	48	1.1	67	67	448	2.8	66

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	169	3.3	71	100	248	4.3	87	100	417	3.8	81
06:30:00	188	3.6	71	90	274	4.7	90	90	462	4.2	82
06:45:00	290	5.5	72	100	427	7.3	89	100	717	6.4	82
07:00:00	388	8.1	66	100	527	9.6	83	100	915	8.8	76
1ht:	**1042A**				**1486A**				**2528**		
07:15:00	410	8.3	68	93	564	10.4	82	93	974	9.3	76
07:30:00	425	9.6	61	87	555	11.6	73	87	980	10.6	68
07:45:00	438	9.3	64	97	566	10.8	80	97	1004	10.1	73
08:00:00	447	10.0	61	90	546	11.0	75	90	993	10.5	69
1ht:	**1719A**				**2231A**				**3950**		
08:15:00	333	6.8	67	97	452	8.2	84	97	785	7.5	77
08:30:00	319	6.2	70	100	440	7.5	89	100	759	6.9	81
08:45:00	312	6.2	69	100	434	7.6	87	100	746	6.9	79
09:00:00	333	6.7	68	87	438	8.1	83	87	771	7.4	77
1ht:	**1296A**				**1765A**				**3061**		
09:15:00	280	5.5	70	97	400	6.9	88	97	680	6.2	80

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	75	1.3	68	100	66	1.3	56	100	118	2.0	79	100	115	2.1	84	100	374	1.7	74
06:30:00	106	1.8	68	90	84	1.8	55	90	126	2.2	79	90	137	2.6	81	90	453	2.1	72
06:45:00	140	2.2	71	100	103	2.1	57	100	230	4.0	78	100	178	3.4	79	100	651	2.9	74
07:00:00	178	2.9	70	100	121	2.3	59	100	249	4.3	80	100	192	3.8	78	100	740	3.3	74
1ht:	**501A**				**375A**				**728A**				**624A**				**2228**		
07:15:00	196	3.2	69	93	158	3.1	58	93	248	4.3	78	93	184	3.5	80	93	786	3.5	72
07:30:00	205	3.5	67	83	142	2.9	56	83	262	4.7	76	83	227	4.8	72	83	836	4.0	69
07:45:00	227	3.7	70	97	162	3.0	61	97	278	4.7	81	97	251	4.9	78	97	918	4.1	74
08:00:00	221	3.5	71	90	167	3.0	63	90	251	4.3	79	90	231	4.4	80	90	870	3.8	74
1ht:	**850A**				**630A**				**1039A**				**894A**				**3413**		
08:15:00	164	2.6	71	97	132	2.6	59	97	193	3.2	83	97	185	3.6	78	97	674	3.0	74
08:30:00	181	2.9	72	90	129	2.5	58	90	150	2.6	80	90	177	3.5	77	90	637	2.9	73
08:45:00	156	2.6	67	87	133	2.6	59	87	128	2.2	80	87	174	3.3	79	87	591	2.7	72
09:00:00	173	2.8	70	80	154	3.1	57	80	153	2.7	76	80	136	2.7	76	80	616	2.8	70
1ht:	**674A**				**546A**				**628A**				**677A**				**2525**		
09:15:00	177	3.0	68	87	122	2.6	53	87	120	2.2	76	87	145	2.9	76	87	564	2.7	69

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	110	2.8	45	100	139	3.5	55	100	79	2.1	57	100	328	2.8	52
06:30:00	136	3.3	47	100	163	4.0	55	100	128	3.4	58	100	427	3.6	53
06:45:00	198	4.8	47	100	198	4.8	56	100	132	3.6	57	100	528	4.4	53
07:00:00	248	5.9	48	100	236	5.6	58	100	152	3.9	59	100	636	5.1	54
1ht:	**692**				**736**				**491**				**1919**		
07:15:00	228	5.5	47	100	226	5.3	59	100	160	4.2	57	100	614	5.0	54
07:30:00	254	5.9	49	100	243	5.9	57	100	200	5.3	58	100	697	5.7	54
07:45:00	338	8.1	48	100	265	6.2	58	100	219	5.8	57	100	822	6.7	54
08:00:00	287	6.8	48	100	234	5.5	59	100	257	6.9	57	100	778	6.4	54
1ht:	**1107**				**968**				**836**				**2911**		
08:15:00	219	5.2	48	100	227	5.5	56	100	172	4.7	56	100	618	5.1	53
08:30:00	200	4.7	49	97	223	5.4	57	97	177	4.8	56	97	600	4.9	54
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	212	5.1	47	97	218	5.5	54	97	193	5.3	56	97	623	5.3	52
1ht:	**841A**				**892A**				**723A**				**2456**		
09:15:00	184	4.5	46	100	181	4.7	53	100	181	4.9	56	100	546	4.7	52
09:30:00	129	3.1	47	100	184	4.7	53	100	141	3.7	57	100	454	3.9	53
09:45:00	130	3.1	48	100	207	5.2	54	100	153	4.2	55	100	490	4.2	53
10:00:00	164	3.9	47	100	191	5.1	52	100	165	4.3	58	100	520	4.4	52
1ht:	**607**				**763**				**640**				**2010**		
10:15:00	151	3.6	47	100	188	5.0	52	100	178	4.7	57	100	517	4.4	52
10:30:00	123	3.0	46	100	184	4.8	53	100	171	4.5	57	100	478	4.1	53
10:45:00	138	3.6	43	100	195	5.2	51	100	191	5.1	57	100	524	4.7	51
11:00:00	141	3.6	45	100	205	5.3	53	100	180	4.7	58	100	526	4.5	53
1ht:	**553**				**772**				**720**				**2045**		
11:15:00	139	3.4	46	100	198	5.2	52	100	157	4.2	56	100	494	4.3	52
11:30:00	173	4.2	47	100	242	6.4	52	100	205	5.3	59	100	620	5.3	53
11:45:00	165	4.0	47	100	206	5.3	53	100	187	4.9	58	100	558	4.8	53
12:00:00	165	4.0	48	100	201	5.3	52	100	156	4.0	59	100	522	4.4	53
1ht:	**642**				**847**				**705**				**2194**		
12:15:00	165	4.1	46	100	221	5.7	53	100	180	4.7	58	100	566	4.8	52
12:30:00	180	4.4	47	100	223	5.8	52	100	182	4.8	58	100	585	5.0	52
12:45:00	181	4.4	47	100	215	5.5	54	100	211	5.3	60	100	607	5.1	54
13:00:00	148	3.7	46	100	211	5.7	51	100	188	4.7	61	100	547	4.7	53
1ht:	**674**				**870**				**761**				**2305**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	153	3.7	47	100	194	5.2	51	100	193	5.0	59	100	540	4.6	53
13:30:00	170	4.2	47	100	216	5.5	54	100	197	5.4	55	100	583	5.0	52
13:45:00	240	5.8	47	100	248	6.4	53	100	225	6.1	56	100	713	6.1	52
14:00:00	197	4.9	46	100	230	6.0	53	100	215	5.5	59	100	642	5.5	53
1ht:	**760**				**888**				**830**				**2478**		
14:15:00	222	5.5	46	100	240	6.2	53	100	220	5.9	56	100	682	5.8	52
14:30:00	259	6.1	48	97	273	7.0	53	97	243	6.3	58	97	775	6.5	53
14:45:00	284	7.0	46	100	247	6.4	53	100	202	5.5	56	100	733	6.3	51
15:00:00	303	7.3	47	100	278	7.1	53	100	171	4.4	59	100	752	6.3	52
1ht:	**1068A**				**1038A**				**835A**				**2941**		
15:15:00	263	6.4	47	100	275	6.9	55	100	201	5.2	59	100	739	6.2	53
15:30:00	296	7.2	47	97	253	6.5	53	97	188	4.9	58	97	737	6.2	52
15:45:00	284	6.8	47	100	261	6.8	52	100	202	5.3	58	100	747	6.3	52
16:00:00	366	9.4	44	90	317	8.3	52	90	214	5.6	58	90	897	7.8	50
1ht:	**1202A**				**1103A**				**805A**				**3110**		
16:15:00	308	7.4	47	100	275	7.1	53	100	204	5.2	60	100	787	6.6	53
16:30:00	330	8.1	47	100	279	7.0	55	100	223	6.0	56	100	832	7.0	52
16:45:00	332	8.0	47	100	323	8.1	55	100	192	5.1	57	100	847	7.0	52
17:00:00	330	7.9	48	100	300	7.4	56	100	211	5.4	59	100	841	6.9	53
1ht:	**1300**				**1177**				**830**				**3307**		
17:15:00	348	8.5	47	100	296	7.3	55	100	193	5.1	58	100	837	7.0	52
17:30:00	371	9.0	47	100	298	7.3	56	100	202	5.4	57	100	871	7.2	52
17:45:00	337	8.1	47	100	262	6.5	55	100	206	5.6	56	100	805	6.7	52
18:00:00	286	6.8	48	93	236	5.8	56	93	197	5.1	58	93	719	5.9	53
1ht:	**1345A**				**1094A**				**798A**				**3237**		
18:15:00	275	6.6	47	100	246	6.1	55	100	198	5.4	55	100	719	6.1	52
18:30:00	304	7.3	48	100	274	6.8	55	100	233	6.5	54	100	811	6.9	52
18:45:00	262	6.3	47	100	216	5.4	55	100	220	6.3	53	100	698	6.0	52
19:00:00	216	5.3	46	100	209	5.0	57	100	204	5.6	55	100	629	5.3	53
1ht:	**1057**				**945**				**855**				**2857**		
19:15:00	188	4.6	47	100	206	5.0	56	100	171	4.6	56	100	565	4.8	53
19:30:00	208	5.0	48	100	195	4.7	56	100	191	5.3	55	100	594	5.0	53
19:45:00	194	4.7	47	100	186	4.4	57	100	192	5.3	56	100	572	4.8	53
20:00:00	157	3.8	47	100	155	3.9	55	100	159	4.6	52	100	471	4.1	51
1ht:	**747**				**742**				**713**				**2202**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
10:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
10:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
10:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
10:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
11:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
11:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
11:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
11:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
12:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
12:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
12:30:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA
12:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
13:00:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
13:30:00	0	0.0	NA	80	0	0.0	NA	80	0	0.0	NA
13:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
14:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
14:15:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
14:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
14:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
15:00:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
15:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
15:30:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
15:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:00:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
19:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
19:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
20:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	137	2.2	84	100	108	2.2	74	100	245	2.2	80
06:30:00	164	2.7	84	100	146	2.9	77	100	310	2.8	81
06:45:00	239	3.8	87	100	152	3.0	78	100	391	3.4	84
07:00:00	298	4.6	88	100	204	3.8	81	100	502	4.2	85
1ht:	**838**				**610**				**1448**		
07:15:00	321	4.9	89	100	211	3.9	83	100	532	4.4	87
07:30:00	341	5.4	86	100	233	4.5	80	100	574	4.9	84
07:45:00	379	6.0	86	100	267	5.3	77	100	646	5.7	82
08:00:00	354	5.5	88	100	233	4.3	82	100	587	4.9	85
1ht:	**1395**				**944**				**2339**		
08:15:00	234	3.7	87	100	194	3.7	79	100	428	3.7	83
08:30:00	267	4.1	90	100	217	4.2	78	100	484	4.1	85
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	248	4.1	82	97	214	4.4	73	97	462	4.3	78
1ht:	**999A**				**833A**				**1832**		
09:15:00	237	3.8	84	100	181	3.7	74	100	418	3.8	80
09:30:00	170	2.8	84	100	177	3.5	77	100	347	3.1	80
09:45:00	175	2.9	83	100	182	3.6	76	100	357	3.2	80
10:00:00	189	3.0	86	100	189	3.8	76	100	378	3.4	81
1ht:	**771**				**729**				**1500**		
10:15:00	182	2.9	85	100	180	3.5	78	100	362	3.2	81
10:30:00	145	2.4	83	100	169	3.4	77	100	314	2.9	79
10:45:00	165	2.8	82	100	185	3.8	74	100	350	3.3	78
11:00:00	192	3.1	84	100	188	3.8	76	100	380	3.5	80
1ht:	**684**				**722**				**1406**		
11:15:00	168	2.8	83	100	203	4.2	73	100	371	3.5	78
11:30:00	217	3.5	84	100	194	4.0	73	100	411	3.8	79
11:45:00	210	3.3	87	100	197	3.8	78	100	407	3.6	82
12:00:00	217	3.5	86	100	176	3.6	73	100	393	3.6	80
1ht:	**812**				**770**				**1582**		
12:15:00	235	3.7	86	100	189	3.8	76	100	424	3.8	82
12:30:00	207	3.4	84	100	185	3.9	72	100	392	3.6	78
12:45:00	222	3.6	85	100	215	4.2	77	100	437	3.9	81
13:00:00	208	3.4	85	100	188	3.8	75	100	396	3.6	80
1ht:	**872**				**777**				**1649**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	202	3.2	88	100	188	3.7	78	100	390	3.4	83
13:30:00	232	3.6	88	100	225	4.5	75	100	457	4.1	82
13:45:00	271	4.4	84	100	239	4.7	77	100	510	4.6	81
14:00:00	285	4.5	86	100	214	4.1	80	100	499	4.3	84
1ht:	**990**				**866**				**1856**		
14:15:00	280	4.5	86	100	230	4.6	76	100	510	4.5	82
14:30:00	324	5.2	85	97	238	4.8	75	97	562	5.0	81
14:45:00	346	5.6	85	100	247	5.0	76	100	593	5.3	81
15:00:00	345	5.8	82	100	252	4.9	78	100	597	5.3	80
1ht:	**1295A**				**967A**				**2262**		
15:15:00	334	5.4	85	100	264	5.3	76	100	598	5.3	81
15:30:00	338	5.4	86	97	268	5.3	77	97	606	5.3	82
15:45:00	326	5.2	85	100	263	5.0	80	100	589	5.1	83
16:00:00	368	6.2	81	93	301	6.1	76	93	669	6.1	79
1ht:	**1364A**				**1094A**				**2458**		
16:15:00	367	5.9	86	100	272	5.4	76	100	639	5.6	82
16:30:00	336	5.5	84	100	291	5.4	82	100	627	5.4	83
16:45:00	390	6.6	81	100	283	5.6	77	100	673	6.1	79
17:00:00	378	6.2	84	100	284	5.7	76	100	662	5.9	80
1ht:	**1471**				**1130**				**2601**		
17:15:00	388	6.3	84	100	293	5.8	77	100	681	6.1	81
17:30:00	414	6.7	85	100	310	5.8	81	100	724	6.2	83
17:45:00	345	5.4	87	100	244	4.5	82	100	589	5.0	85
18:00:00	326	5.2	85	100	267	5.1	80	100	593	5.2	83
1ht:	**1473**				**1114**				**2587**		
18:15:00	304	4.9	86	100	246	4.7	80	100	550	4.8	83
18:30:00	328	5.4	84	100	266	5.3	77	100	594	5.3	81
18:45:00	281	4.5	86	100	216	4.4	74	100	497	4.5	81
19:00:00	255	4.2	84	100	229	4.5	77	100	484	4.3	81
1ht:	**1168**				**957**				**2125**		
19:15:00	214	3.4	86	100	178	3.6	76	100	392	3.5	81
19:30:00	214	3.3	89	100	169	3.3	78	100	383	3.3	84
19:45:00	212	3.4	86	100	186	3.5	81	100	398	3.4	84
20:00:00	179	2.8	87	100	157	2.9	82	100	336	2.9	85
1ht:	**819**				**690**				**1509**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	189	3.4	64	100	137	2.7	70	100	35	0.7	78	100	361	2.2	68
06:30:00	229	4.1	64	100	164	3.2	71	100	48	1.0	73	100	441	2.8	67
06:45:00	326	6.0	62	100	208	4.0	71	100	40	0.8	73	100	574	3.6	66
07:00:00	414	7.8	60	100	265	5.2	70	100	79	1.6	73	100	758	4.9	65
1ht:	**1158**				**774**				**202**				**2134**		
07:15:00	498	9.7	58	100	299	6.0	69	100	55	1.2	71	100	852	5.6	63
07:30:00	394	17.9	25	100	349	13.5	35	100	82	1.9	65	100	825	11.1	33
07:45:00	438	12.5	40	100	301	7.8	53	100	94	2.2	66	100	833	7.5	47
08:00:00	388	13.5	33	100	314	9.1	47	100	86	2.0	66	100	788	8.2	42
1ht:	**1718**				**1263**				**317**				**3298**		
08:15:00	341	6.1	64	100	224	4.3	71	100	55	1.2	71	100	620	3.9	67
08:30:00	355	6.3	64	97	224	4.5	68	97	42	0.9	75	97	621	3.9	66
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	362	7.0	59	97	230	4.7	67	97	73	1.6	68	97	665	4.4	63
1ht:	**1410A**				**904A**				**228A**				**2542**		
09:15:00	303	5.7	61	100	212	4.2	70	100	73	1.9	59	100	588	3.9	64
09:30:00	249	4.9	58	100	203	3.9	71	100	56	1.2	69	100	508	3.3	64
09:45:00	233	4.5	59	100	208	4.2	68	100	60	1.4	66	100	501	3.4	63
10:00:00	244	4.7	59	100	219	4.4	68	100	62	1.4	66	100	525	3.5	63
1ht:	**1029**				**842**				**251**				**2122**		
10:15:00	241	4.5	61	100	212	4.2	69	100	52	1.2	66	100	505	3.3	65
10:30:00	231	4.5	58	100	215	4.2	70	100	40	0.9	72	100	486	3.2	65
10:45:00	240	4.6	60	100	210	4.4	65	100	41	0.8	75	100	491	3.3	63
11:00:00	248	4.8	59	100	217	4.6	64	100	48	1.1	69	100	513	3.5	62
1ht:	**960**				**854**				**181**				**1995**		
11:15:00	243	4.6	60	100	207	4.4	65	100	60	1.3	70	100	510	3.4	63
11:30:00	269	5.3	58	100	219	4.6	65	100	41	0.9	68	100	529	3.6	62
11:45:00	281	5.6	58	100	217	4.5	67	100	70	1.5	69	100	568	3.9	63
12:00:00	244	4.6	60	100	219	4.5	66	100	59	1.3	68	100	522	3.5	64
1ht:	**1037**				**862**				**230**				**2129**		
12:15:00	275	5.3	60	100	234	4.8	67	100	68	1.5	68	100	577	3.8	64
12:30:00	277	5.5	58	100	201	4.3	64	100	63	1.5	66	100	541	3.7	61
12:45:00	273	5.2	59	100	233	4.6	69	100	54	1.2	68	100	560	3.7	64
13:00:00	279	5.5	58	100	208	4.3	67	100	69	1.5	70	100	556	3.7	63
1ht:	**1104**				**876**				**254**				**2234**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	256	4.8	61	100	203	4.2	66	100	69	1.5	69	100	528	3.5	64
13:30:00	287	5.5	60	100	236	4.9	66	100	82	1.8	68	100	605	4.1	63
13:45:00	283	5.5	59	100	249	5.1	67	100	72	1.6	68	100	604	4.0	63
14:00:00	328	6.2	61	100	245	4.8	69	100	80	1.8	68	100	653	4.3	65
1ht:	**1154**				**933**				**303**				**2390**		
14:15:00	339	6.4	60	100	241	4.9	67	100	70	1.5	70	100	650	4.3	64
14:30:00	384	7.4	59	97	264	5.3	68	97	71	1.5	73	97	719	4.7	64
14:45:00	394	7.5	60	100	257	5.4	65	100	75	1.7	66	100	726	4.9	62
15:00:00	407	7.9	59	100	278	5.7	67	100	86	1.9	67	100	771	5.2	62
1ht:	**1524A**				**1040A**				**303A**				**2867**		
15:15:00	389	7.4	60	100	249	5.2	66	100	78	1.7	71	100	716	4.8	63
15:30:00	409	7.7	61	93	233	4.8	66	93	104	2.5	64	93	746	5.0	63
15:45:00	358	6.8	60	100	269	5.3	69	100	75	1.7	68	100	702	4.6	64
16:00:00	394	7.7	59	93	269	5.5	67	93	87	1.9	68	93	750	5.0	63
1ht:	**1549A**				**1020A**				**342A**				**2911**		
16:15:00	427	8.2	59	100	276	5.6	68	100	82	1.7	74	100	785	5.2	64
16:30:00	409	7.9	59	100	286	5.6	70	100	92	2.1	68	100	787	5.2	64
16:45:00	432	8.3	59	100	288	5.8	68	100	82	1.8	70	100	802	5.3	63
17:00:00	468	11.3	47	100	286	6.9	57	100	100	2.4	64	100	854	6.9	52
1ht:	**1736**				**1136**				**356**				**3228**		
17:15:00	424	9.3	52	100	278	5.9	64	100	93	2.1	69	100	795	5.8	58
17:30:00	445	10.6	48	100	279	6.5	59	100	110	2.5	66	100	834	6.5	54
17:45:00	389	7.5	59	100	229	4.5	70	100	78	1.7	71	100	696	4.5	64
18:00:00	332	6.6	57	93	237	4.8	68	93	77	1.7	71	93	646	4.3	63
1ht:	**1595A**				**1024A**				**359A**				**2978**		
18:15:00	350	7.0	57	100	225	4.5	68	100	76	1.6	71	100	651	4.4	62
18:30:00	353	7.0	58	100	225	4.5	68	100	71	1.6	69	100	649	4.4	62
18:45:00	337	6.7	57	100	212	4.6	63	100	68	1.4	73	100	617	4.2	61
19:00:00	282	5.5	58	100	165	3.3	68	100	76	1.8	64	100	523	3.5	62
1ht:	**1322**				**827**				**291**				**2440**		
19:15:00	236	4.4	62	100	164	3.4	65	100	54	1.2	71	100	454	3.0	64
19:30:00	254	4.8	61	100	169	3.5	67	100	45	0.9	79	100	468	3.0	65
19:45:00	214	4.1	60	100	167	3.3	70	100	49	1.0	74	100	430	2.8	65
20:00:00	196	3.7	61	100	138	2.8	68	100	45	0.9	80	100	379	2.4	65
1ht:	**900**				**638**				**193**				**1731**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	157	3.2	68	100	255	4.3	89	100	412	3.7	81
06:30:00	210	4.1	69	100	309	5.3	89	100	519	4.7	81
06:45:00	272	5.4	69	100	422	7.2	89	100	694	6.3	81
07:00:00	377	7.7	67	100	500	8.7	87	100	877	8.2	79
1ht:	**1016**				**1486**				**2502**		
07:15:00	434	9.0	66	100	562	10.1	84	100	996	9.6	76
07:30:00	432	9.5	63	100	535	10.5	77	100	967	10.0	71
07:45:00	434	9.5	63	100	585	11.2	79	100	1019	10.4	72
08:00:00	444	9.5	64	100	557	11.1	77	100	1001	10.3	71
1ht:	**1744**				**2239**				**3983**		
08:15:00	313	6.1	70	100	470	8.0	90	100	783	7.0	82
08:30:00	337	7.0	66	100	507	8.8	88	100	844	7.9	79
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	317	6.5	67	97	466	8.4	85	97	783	7.4	77
1ht:	**1289A**				**1924A**				**3213**		
09:15:00	268	5.5	67	100	387	6.8	86	100	655	6.2	78
09:30:00	257	5.2	68	100	337	5.8	88	100	594	5.5	79
09:45:00	255	5.0	70	100	318	5.5	88	100	573	5.3	80
10:00:00	272	5.7	66	100	352	6.3	86	100	624	6.0	77
1ht:	**1052**				**1394**				**2446**		
10:15:00	270	5.2	71	100	305	5.4	86	100	575	5.3	79
10:30:00	256	5.3	67	100	299	5.1	88	100	555	5.2	78
10:45:00	278	5.7	66	100	294	5.2	86	100	572	5.5	77
11:00:00	276	5.7	66	100	301	5.4	85	100	577	5.5	76
1ht:	**1080**				**1199**				**2279**		
11:15:00	270	5.5	68	100	296	5.4	84	100	566	5.4	76
11:30:00	278	6.0	64	100	347	6.3	84	100	625	6.1	75
11:45:00	283	5.7	68	100	331	5.8	87	100	614	5.7	78
12:00:00	270	5.5	67	100	314	5.5	87	100	584	5.5	78
1ht:	**1101**				**1288**				**2389**		
12:15:00	287	5.9	67	100	347	6.1	87	100	634	6.0	78
12:30:00	261	5.7	63	100	329	5.8	86	100	590	5.7	76
12:45:00	283	5.7	67	100	348	6.3	84	100	631	6.0	77
13:00:00	277	5.6	67	100	328	5.8	85	100	605	5.7	77
1ht:	**1108**				**1352**				**2460**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	239	5.0	65	100	307	5.3	88	100	546	5.2	78
13:30:00	281	5.9	65	97	348	6.2	85	97	629	6.1	76
13:45:00	297	6.1	67	100	369	6.4	87	100	666	6.2	78
14:00:00	286	5.6	70	100	414	7.2	88	100	700	6.4	81
1ht:	**1103A**				**1438A**				**2541**		
14:15:00	324	6.7	66	100	434	7.7	86	100	758	7.2	78
14:30:00	349	7.3	65	97	454	8.0	86	97	803	7.7	77
14:45:00	338	7.0	66	100	454	8.2	84	100	792	7.6	76
15:00:00	355	7.5	65	100	482	8.7	84	100	837	8.1	76
1ht:	**1365A**				**1824A**				**3189**		
15:15:00	332	6.9	66	100	479	8.6	84	100	811	7.8	77
15:30:00	355	7.3	67	97	489	8.8	84	97	844	8.1	77
15:45:00	335	6.9	67	100	456	8.3	84	100	791	7.6	76
16:00:00	358	7.5	66	93	447	8.2	83	93	805	7.8	75
1ht:	**1378A**				**1872A**				**3250**		
16:15:00	349	7.0	68	100	494	8.7	86	100	843	7.8	79
16:30:00	351	7.1	68	100	520	9.5	83	100	871	8.3	77
16:45:00	333	7.1	64	100	526	9.8	82	100	859	8.5	75
17:00:00	373	8.7	59	100	516	10.5	75	100	889	9.6	68
1ht:	**1406**				**2056**				**3462**		
17:15:00	368	7.9	64	100	512	9.7	80	100	880	8.8	73
17:30:00	399	8.8	62	100	538	11.0	74	100	937	9.9	69
17:45:00	336	6.6	70	100	483	8.9	82	100	819	7.7	77
18:00:00	330	6.6	68	100	436	7.7	86	100	766	7.2	78
1ht:	**1433**				**1969**				**3402**		
18:15:00	305	6.3	66	100	430	7.9	83	100	735	7.1	76
18:30:00	295	5.9	68	100	415	7.4	85	100	710	6.6	78
18:45:00	323	8.8	50	100	391	8.6	69	100	714	8.7	61
19:00:00	237	5.0	65	100	337	6.0	86	100	574	5.5	77
1ht:	**1160**				**1573**				**2733**		
19:15:00	204	4.1	68	100	269	4.6	88	100	473	4.4	79
19:30:00	217	4.4	68	100	303	5.3	87	100	520	4.8	79
19:45:00	198	3.9	69	100	267	4.5	89	100	465	4.2	81
20:00:00	172	3.4	70	100	234	3.9	91	100	406	3.6	82
1ht:	**791**				**1073**				**1864**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	93	1.6	67	100	77	1.6	55	100	122	2.1	78	100	103	1.9	82	100	395	1.8	72
06:30:00	106	1.8	66	100	95	1.8	61	100	128	2.2	79	100	136	2.6	80	100	465	2.1	72
06:45:00	143	2.5	64	100	115	2.2	59	100	208	3.6	80	100	172	3.3	80	100	638	2.9	73
07:00:00	177	3.0	68	100	129	2.5	59	100	229	3.8	83	100	196	3.8	78	100	731	3.3	74
1ht:	**519**				**416**				**687**				**607**				**2229**		
07:15:00	184	3.1	69	100	149	2.7	64	100	245	4.2	80	100	202	3.8	81	100	780	3.4	74
07:30:00	210	3.6	66	100	133	2.4	63	100	281	4.9	78	100	222	4.3	78	100	846	3.8	73
07:45:00	216	3.7	66	100	168	3.2	60	100	268	4.6	79	100	245	4.7	80	100	897	4.1	73
08:00:00	241	4.0	68	100	184	3.3	65	100	229	3.8	82	100	228	4.3	82	100	882	3.8	74
1ht:	**851**				**634**				**1023**				**897**				**3405**		
08:15:00	159	2.7	68	100	140	2.5	63	100	188	3.1	84	100	181	3.4	82	100	668	2.9	75
08:30:00	195	3.3	68	100	154	3.0	59	100	199	3.4	81	100	202	3.9	79	100	750	3.4	73
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	122	2.3	62	47	120	2.4	57	47	133	2.6	71	47	129	2.9	69	47	504	2.5	65
1ht:	**666A**				**568A**				**728A**				**718A**				**2680**		
09:15:00	114	2.2	60	83	115	2.4	54	83	89	1.7	72	83	103	2.2	72	83	421	2.1	64
09:30:00	122	2.2	63	90	127	2.5	58	90	116	2.2	73	90	122	2.4	79	90	487	2.3	68
09:45:00	104	1.8	67	100	114	2.2	58	100	114	2.0	80	100	147	2.9	76	100	479	2.2	71
10:00:00	138	2.3	68	100	101	2.0	56	100	126	2.2	77	100	140	2.8	75	100	505	2.3	70
1ht:	**479A**				**455A**				**448A**				**518A**				**1900**		
10:15:00	106	1.8	68	100	100	1.9	61	100	120	2.2	76	100	127	2.5	78	100	453	2.1	71
10:30:00	120	2.0	68	100	118	2.4	57	100	117	2.0	79	100	145	2.9	75	100	500	2.3	70
10:45:00	117	2.0	66	100	119	2.5	54	100	99	1.8	77	100	118	2.4	76	100	453	2.2	68
11:00:00	115	2.0	64	100	122	2.5	55	100	104	1.9	76	100	107	2.2	73	100	448	2.2	67
1ht:	**458**				**459**				**440**				**497**				**1854**		
11:15:00	120	2.1	66	100	110	2.2	56	100	94	1.8	72	100	130	2.6	75	100	454	2.2	68
11:30:00	135	2.5	62	100	156	3.1	58	100	76	1.4	76	100	106	2.1	77	100	473	2.3	66
11:45:00	126	2.1	69	100	129	2.5	59	100	109	1.9	78	100	105	2.1	76	100	469	2.2	70
12:00:00	120	2.0	68	100	138	2.9	55	100	92	1.6	77	100	112	2.3	76	100	462	2.2	68
1ht:	**501**				**533**				**371**				**453**				**1858**		
12:15:00	155	2.6	68	100	143	2.8	58	100	97	1.7	78	100	123	2.4	77	100	518	2.4	69
12:30:00	124	2.1	66	100	132	2.7	56	100	103	1.8	78	100	124	2.6	72	100	483	2.3	68
12:45:00	116	2.1	63	90	124	2.7	53	90	99	1.9	71	90	122	2.7	70	90	461	2.3	64
13:00:00	104	1.8	65	80	95	2.0	54	80	100	1.8	76	80	124	2.5	75	80	423	2.0	68
1ht:	**504A**				**501A**				**399A**				**493A**				**1897**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	104	1.9	64	97	108	2.3	55	97	121	2.4	69	97	129	2.9	69	97	462	2.3	65
13:30:00	130	2.2	67	100	153	3.1	57	100	118	2.0	79	100	119	2.4	77	100	520	2.4	69
13:45:00	153	2.7	66	100	145	2.9	58	100	120	2.1	77	100	140	2.8	77	100	558	2.6	69
14:00:00	171	2.9	68	100	166	3.1	61	100	118	2.0	79	100	117	2.3	76	100	572	2.6	70
1ht:	**560A**				**573A**				**477A**				**505A**				**2115**		
14:15:00	179	3.0	68	100	151	3.0	57	100	110	2.0	76	100	137	2.8	74	100	577	2.7	68
14:30:00	188	3.2	67	97	160	3.2	58	97	122	2.2	77	97	127	2.5	79	97	597	2.7	69
14:45:00	204	3.5	66	100	188	3.7	57	100	140	2.5	75	100	133	2.7	75	100	665	3.1	67
15:00:00	211	3.6	67	100	187	3.6	60	100	139	2.5	75	100	145	2.9	76	100	682	3.1	69
1ht:	**783A**				**687A**				**511A**				**543A**				**2524**		
15:15:00	213	3.6	68	100	184	3.5	61	100	143	2.5	77	100	142	2.8	76	100	682	3.1	70
15:30:00	233	4.0	67	97	184	3.5	60	97	119	2.1	77	97	153	2.9	79	97	689	3.1	70
15:45:00	191	3.3	66	100	179	3.4	60	100	122	2.1	79	100	133	2.6	77	100	625	2.9	69
16:00:00	220	3.8	66	93	163	3.1	60	93	96	1.7	77	93	141	2.8	77	93	620	2.8	69
1ht:	**855A**				**711A**				**482A**				**569A**				**2617**		
16:15:00	246	4.2	67	100	199	3.7	61	100	99	1.7	79	100	149	2.9	79	100	693	3.1	70
16:30:00	268	4.5	68	100	197	3.6	63	100	127	2.2	80	100	122	2.3	81	100	714	3.1	71
16:45:00	257	4.4	67	100	176	3.3	61	100	120	2.1	77	100	134	2.6	80	100	687	3.1	70
17:00:00	277	4.8	66	100	226	4.4	59	100	123	2.2	77	100	120	2.3	81	100	746	3.4	68
1ht:	**1048**				**798**				**469**				**525**				**2840**		
17:15:00	261	4.5	66	100	192	3.6	60	100	100	1.8	75	100	139	2.7	79	100	692	3.1	69
17:30:00	321	5.5	67	100	223	4.2	60	100	94	1.7	77	100	129	2.5	79	100	767	3.5	68
17:45:00	288	5.0	66	100	170	3.2	62	100	95	1.7	79	100	118	2.2	81	100	671	3.0	69
18:00:00	227	3.8	67	100	173	3.3	60	100	106	1.9	76	100	125	2.4	80	100	631	2.9	69
1ht:	**1097**				**758**				**395**				**511**				**2761**		
18:15:00	203	3.5	66	100	161	3.0	60	100	89	1.6	77	100	124	2.4	80	100	577	2.6	69
18:30:00	201	3.4	67	100	176	3.4	58	100	105	1.9	76	100	128	2.5	79	100	610	2.8	69
18:45:00	206	3.6	65	100	163	3.3	56	100	73	1.4	73	100	107	2.3	71	100	549	2.6	65
19:00:00	178	3.1	65	100	136	2.7	58	100	78	1.4	76	100	106	2.1	77	100	498	2.3	67
1ht:	**788**				**636**				**345**				**465**				**2234**		
19:15:00	144	2.5	66	100	130	2.6	57	100	67	1.3	73	100	84	1.6	80	100	425	2.0	67
19:30:00	130	2.3	64	100	123	2.4	58	100	62	1.1	79	100	94	1.8	79	100	409	1.9	68
19:45:00	125	2.1	67	100	127	2.4	61	100	55	1.0	75	100	82	1.6	79	100	389	1.8	69
20:00:00	118	2.0	67	100	113	2.2	59	100	56	1.0	76	100	72	1.4	78	100	359	1.6	68
1ht:	**517**				**493**				**240**				**332**				**1582**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	107	2.7	45	100	135	3.3	56	100	85	2.3	56	100	327	2.8	52
06:30:00	124	3.0	47	83	146	3.7	54	83	120	3.4	54	83	390	3.3	52
06:45:00	171	4.1	48	100	181	4.4	56	100	136	3.6	57	100	488	4.0	53
07:00:00	272	6.5	48	100	217	5.4	55	100	137	3.8	54	100	626	5.3	52
1ht:	**681A**				**683A**				**478A**				**1842**		
07:15:00	233	5.8	46	100	217	5.3	57	100	165	4.5	55	100	615	5.2	52
07:30:00	222	5.5	46	93	182	4.4	57	93	189	5.2	56	93	593	5.0	53
07:45:00	291	7.3	46	90	213	5.1	57	90	167	4.5	56	90	671	5.6	52
08:00:00	286	6.9	47	97	243	5.8	58	97	210	5.7	56	97	739	6.1	53
1ht:	**1029A**				**857A**				**731A**				**2617**		
08:15:00	175	4.3	46	93	153	3.7	57	93	137	3.6	57	93	465	3.9	53
08:30:00	175	4.2	47	73	200	4.7	58	73	142	3.8	57	73	517	4.2	54
08:45:00	193	4.8	46	93	210	4.9	58	93	179	4.9	56	93	582	4.9	54
09:00:00	251	6.1	47	100	237	5.6	58	100	162	4.4	56	100	650	5.4	53
1ht:	**802A**				**803A**				**623A**				**2228**		
09:15:00	164	3.9	48	97	187	4.5	57	97	148	4.0	57	97	499	4.1	54
09:30:00	177	4.2	48	97	207	5.0	56	97	151	4.0	57	97	535	4.4	54
09:45:00	183	4.4	47	90	190	4.7	56	90	127	3.4	56	90	500	4.2	53
10:00:00	167	4.0	48	97	210	5.3	55	97	188	5.3	54	97	565	4.8	52
1ht:	**691A**				**795A**				**616A**				**2102**		
10:15:00	144	3.4	48	100	187	4.7	54	100	174	4.7	56	100	505	4.3	53
10:30:00	110	2.7	47	97	150	4.1	51	97	137	3.6	57	97	397	3.5	52
10:45:00	116	2.8	46	93	166	4.3	53	93	144	3.9	56	93	426	3.7	52
11:00:00	133	3.2	47	90	197	5.0	54	90	174	4.8	56	90	504	4.3	53
1ht:	**503A**				**699A**				**628A**				**1830**		
11:15:00	94	2.3	46	80	144	3.7	53	80	146	4.1	55	80	384	3.4	52
11:30:00	142	3.5	46	87	192	5.0	52	87	173	4.6	57	87	507	4.4	52
11:45:00	146	3.7	45	100	189	4.9	53	100	143	3.7	59	100	478	4.1	52
12:00:00	171	4.2	47	100	205	5.3	53	100	165	4.4	57	100	541	4.6	52
1ht:	**562A**				**736A**				**627A**				**1925**		
12:15:00	173	4.3	46	100	223	5.8	53	100	174	4.7	56	100	570	4.9	52
12:30:00	170	4.1	47	100	185	5.0	51	100	178	4.7	57	100	533	4.6	52
12:45:00	167	4.0	47	97	226	5.9	52	97	201	5.5	56	97	594	5.1	52
13:00:00	149	3.7	45	100	218	5.7	52	100	187	5.1	56	100	554	4.8	52
1ht:	**658A**				**851A**				**739A**				**2248**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	187	4.7	45	97	201	5.5	50	97	183	4.9	56	97	571	5.1	50
13:30:00	188	4.7	46	100	204	5.3	53	100	180	4.8	58	100	572	4.9	52
13:45:00	215	5.5	44	93	231	5.9	54	93	190	5.1	57	93	636	5.5	51
14:00:00	230	5.7	46	90	194	4.8	55	90	187	4.9	58	90	611	5.1	53
1ht:	**818A**				**831A**				**739A**				**2388**		
14:15:00	228	5.5	47	97	220	5.7	53	97	221	5.9	57	97	669	5.7	52
14:30:00	233	5.7	47	97	212	5.4	54	97	213	5.7	57	97	658	5.6	52
14:45:00	235	5.7	47	97	222	5.8	52	97	189	4.9	58	97	646	5.5	52
15:00:00	290	7.2	46	93	218	5.4	55	93	183	4.9	57	93	691	5.8	52
1ht:	**984A**				**872A**				**808A**				**2664**		
15:15:00	285	6.7	48	100	274	6.8	55	100	186	4.9	58	100	745	6.1	53
15:30:00	245	5.9	48	87	211	5.2	55	87	165	4.4	58	87	621	5.2	53
15:45:00	239	5.7	48	93	208	5.3	54	93	160	4.1	59	93	607	5.0	53
16:00:00	277	6.7	47	83	265	6.7	54	83	185	4.9	58	83	727	6.1	52
1ht:	**1047A**				**960A**				**696A**				**2703**		
16:15:00	291	7.1	47	90	258	6.5	54	90	174	4.6	57	90	723	6.1	52
16:30:00	316	7.9	46	87	242	6.3	53	87	165	4.4	57	87	723	6.2	51
16:45:00	220	5.4	47	70	176	4.7	52	70	144	3.7	59	70	540	4.6	52
17:00:00	340	8.3	47	90	246	6.5	52	90	194	5.2	57	90	780	6.7	51
1ht:	**1183A**				**934A**				**684A**				**2801**		
17:15:00	258	6.4	46	90	201	5.3	52	90	167	4.4	58	90	626	5.4	51
17:30:00	325	8.1	46	97	278	7.1	54	97	213	5.7	56	97	816	7.0	51
17:45:00	259	6.4	46	83	216	5.6	53	83	181	5.3	52	83	656	5.8	50
18:00:00	293	7.1	47	100	245	6.0	56	100	219	6.0	56	100	757	6.4	52
1ht:	**1141A**				**946A**				**785A**				**2872**		
18:15:00	259	6.2	48	93	231	5.8	55	93	184	5.1	55	93	674	5.7	52
18:30:00	275	6.6	48	93	214	5.2	56	93	225	6.4	53	93	714	6.1	52
18:45:00	223	5.4	47	80	160	4.2	52	80	163	4.7	53	80	546	4.7	50
19:00:00	189	4.6	47	90	178	4.5	54	90	173	5.0	53	90	540	4.7	51
1ht:	**950A**				**790A**				**749A**				**2489**		
19:15:00	182	4.6	46	87	140	3.6	53	87	178	5.4	50	87	500	4.5	49
19:30:00	171	4.3	45	97	149	3.7	56	97	168	4.7	55	97	488	4.2	52
19:45:00	159	4.0	46	63	142	3.5	56	63	158	4.3	56	63	459	3.9	53
20:00:00	143	3.5	47	93	135	3.3	56	93	164	4.9	51	93	442	3.9	51
1ht:	**655A**				**566A**				**669A**				**1890**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
08:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
09:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
10:00:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
10:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
10:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
10:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
11:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
11:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
11:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
11:45:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA
12:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
12:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
12:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
12:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
13:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
13:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
13:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
14:00:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
14:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
14:30:00	0	0.0	NA	70	0	0.0	NA	70	0	0.0	NA
14:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
15:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
17:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
18:15:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
18:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
18:45:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
19:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
19:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
20:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	122	1.9	87	100	119	2.4	77	100	241	2.1	82
06:30:00	171	2.8	84	93	135	2.8	73	93	306	2.8	79
06:45:00	212	3.3	87	100	158	3.0	81	100	370	3.2	84
07:00:00	320	5.1	85	100	191	3.9	75	100	511	4.5	82
1ht:	**828A**				**604A**				**1432**		
07:15:00	330	5.2	86	100	209	3.9	81	100	539	4.6	84
07:30:00	318	5.1	86	100	218	4.3	78	100	536	4.7	83
07:45:00	362	5.8	86	97	278	5.3	81	97	640	5.5	83
08:00:00	355	5.6	87	100	258	4.9	80	100	613	5.2	84
1ht:	**1364A**				**962A**				**2326**		
08:15:00	275	4.3	88	97	186	3.6	79	97	461	3.9	85
08:30:00	264	4.1	89	90	232	4.5	79	90	496	4.3	84
08:45:00	260	4.1	88	97	221	4.3	79	97	481	4.2	84
09:00:00	304	4.8	87	100	252	5.0	77	100	556	4.9	83
1ht:	**1105A**				**892A**				**1997**		
09:15:00	213	3.3	88	100	202	4.1	76	100	415	3.7	82
09:30:00	218	3.4	87	97	203	4.1	76	97	421	3.7	82
09:45:00	225	3.6	85	100	214	4.2	77	100	439	3.9	81
10:00:00	233	3.7	86	97	189	3.8	75	97	422	3.8	81
1ht:	**889A**				**808A**				**1697**		
10:15:00	191	3.1	85	100	192	4.0	74	100	383	3.5	79
10:30:00	177	2.8	86	100	195	3.9	76	100	372	3.4	81
10:45:00	192	3.0	87	100	188	3.7	77	100	380	3.4	82
11:00:00	201	3.2	86	100	208	4.1	77	100	409	3.6	82
1ht:	**761**				**783**				**1544**		
11:15:00	173	2.7	87	93	194	3.9	76	93	367	3.3	81
11:30:00	191	3.0	88	97	214	4.2	78	97	405	3.6	83
11:45:00	203	3.2	87	100	197	4.0	76	100	400	3.6	82
12:00:00	215	3.3	88	100	202	4.1	75	100	417	3.7	82
1ht:	**784A**				**807A**				**1591**		
12:15:00	228	3.6	87	100	220	4.4	77	100	448	4.0	82
12:30:00	205	3.2	87	100	206	4.2	74	100	411	3.7	80
12:45:00	220	3.5	86	97	220	4.5	74	97	440	4.0	80
13:00:00	220	3.5	87	100	208	4.1	78	100	428	3.8	83
1ht:	**873A**				**854A**				**1727**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	213	3.4	87	97	208	4.1	77	97	421	3.7	82
13:30:00	255	4.0	87	100	229	4.6	76	100	484	4.3	82
13:45:00	276	4.3	88	100	262	5.4	74	100	538	4.8	81
14:00:00	316	5.0	87	93	244	4.7	80	93	560	4.8	84
1ht:	**1058A**				**944A**				**2002**		
14:15:00	279	4.3	89	100	235	4.6	78	100	514	4.4	84
14:30:00	290	4.6	87	100	239	4.8	76	100	529	4.7	82
14:45:00	333	5.2	87	100	233	4.8	74	100	566	5.0	81
15:00:00	375	6.0	85	100	277	5.6	75	100	652	5.8	81
1ht:	**1277**				**984**				**2261**		
15:15:00	363	5.7	87	100	290	5.9	74	100	653	5.8	81
15:30:00	378	6.2	83	93	297	6.1	74	93	675	6.1	79
15:45:00	304	4.8	87	100	265	5.1	79	100	569	4.9	83
16:00:00	360	5.8	85	100	279	5.6	76	100	639	5.7	81
1ht:	**1403A**				**1130A**				**2533**		
16:15:00	377	6.0	86	100	280	5.6	76	100	657	5.8	82
16:30:00	392	6.3	85	100	288	6.1	72	100	680	6.2	79
16:45:00	329	5.3	86	93	267	5.2	78	93	596	5.2	82
17:00:00	369	5.9	85	97	298	5.7	80	97	667	5.8	83
1ht:	**1470A**				**1133A**				**2603**		
17:15:00	370	5.9	86	100	288	5.5	80	100	658	5.7	83
17:30:00	406	6.5	85	100	295	5.8	77	100	701	6.2	82
17:45:00	392	6.3	85	97	289	5.8	76	97	681	6.0	81
18:00:00	334	5.2	88	100	252	4.6	83	100	586	4.9	86
1ht:	**1502A**				**1123A**				**2625**		
18:15:00	309	4.9	87	100	256	4.9	79	100	565	4.9	83
18:30:00	290	4.8	83	93	241	4.9	74	93	531	4.8	79
18:45:00	300	4.8	86	87	212	4.2	77	87	512	4.5	82
19:00:00	248	3.9	87	97	199	3.7	81	97	447	3.8	84
1ht:	**1147A**				**910A**				**2057**		
19:15:00	234	3.7	86	100	185	3.6	78	100	419	3.7	83
19:30:00	204	3.2	88	100	160	3.2	77	100	364	3.2	83
19:45:00	213	3.4	86	97	178	3.5	76	97	391	3.5	82
20:00:00	182	2.8	88	100	159	3.2	76	100	341	3.0	82
1ht:	**833A**				**682A**				**1515**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	164	3.0	63	100	139	2.7	72	100	39	0.8	78	100	342	2.1	68
06:30:00	188	3.5	61	90	137	2.7	70	90	49	1.1	70	90	374	2.4	65
06:45:00	332	6.4	59	100	200	4.0	69	100	57	1.2	70	100	589	3.9	64
07:00:00	421	8.2	59	100	241	4.9	67	100	66	1.4	70	100	728	4.8	63
1ht:	**1114A**				**721A**				**211A**				**2046**		
07:15:00	507	10.9	53	100	302	6.1	68	100	65	1.4	71	100	874	6.1	59
07:30:00	396	21.3	21	100	325	10.5	42	100	79	1.8	67	100	800	11.2	34
07:45:00	351	16.8	24	87	263	8.0	45	87	80	1.8	66	87	694	8.9	37
08:00:00	373	14.1	30	93	299	10.0	41	93	90	2.0	68	93	762	8.7	39
1ht:	**1637A**				**1194A**				**313A**				**3144**		
08:15:00	339	6.2	62	97	216	4.2	70	97	42	0.8	77	97	597	3.8	66
08:30:00	287	5.5	60	77	210	4.1	71	77	42	0.8	76	77	539	3.5	65
08:45:00	327	6.0	62	97	223	4.5	69	97	60	1.2	74	97	610	3.9	66
09:00:00	365	6.9	61	100	240	4.6	72	100	84	2.0	63	100	689	4.5	65
1ht:	**1329A**				**893A**				**232A**				**2454**		
09:15:00	289	5.2	63	100	218	4.3	70	100	51	1.1	71	100	558	3.5	66
09:30:00	239	4.5	61	87	189	3.8	69	87	53	1.1	71	87	481	3.1	65
09:45:00	234	4.4	60	93	206	4.1	69	93	46	0.9	80	93	486	3.1	66
10:00:00	313	5.9	60	87	223	4.4	69	87	50	1.1	72	87	586	3.8	65
1ht:	**1075A**				**837A**				**200A**				**2112**		
10:15:00	226	4.1	63	100	204	4.1	68	100	41	0.9	72	100	471	3.0	66
10:30:00	258	4.9	60	100	225	4.8	64	100	48	1.1	65	100	531	3.6	62
10:45:00	284	5.3	61	100	210	4.3	66	100	58	1.2	73	100	552	3.6	64
11:00:00	262	4.8	62	100	202	4.1	67	100	50	1.1	72	100	514	3.3	65
1ht:	**1030**				**841**				**197**				**2068**		
11:15:00	193	3.6	61	93	181	3.6	69	93	47	1.0	72	93	421	2.7	66
11:30:00	239	4.5	61	97	203	4.0	69	97	72	1.6	71	97	514	3.4	65
11:45:00	251	4.8	60	100	240	4.9	67	100	65	1.4	69	100	556	3.7	64
12:00:00	270	5.0	61	100	209	4.4	65	100	58	1.3	70	100	537	3.6	63
1ht:	**956A**				**835A**				**243A**				**2034**		
12:15:00	283	5.2	62	100	242	5.0	67	100	79	1.7	71	100	604	4.0	65
12:30:00	257	4.9	59	100	204	4.2	67	100	49	1.1	66	100	510	3.4	63
12:45:00	271	5.1	61	97	230	4.8	66	97	67	1.5	70	97	568	3.8	64
13:00:00	276	5.3	59	100	215	4.3	68	100	63	1.4	70	100	554	3.7	64
1ht:	**1087A**				**890A**				**258A**				**2235**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	283	5.3	61	97	224	4.4	70	97	52	1.1	70	97	559	3.6	65
13:30:00	274	4.9	63	100	237	4.8	67	100	64	1.4	68	100	575	3.7	66
13:45:00	314	6.1	59	100	234	4.9	65	100	58	1.3	67	100	606	4.1	62
14:00:00	371	6.8	62	93	264	5.2	69	93	72	1.5	73	93	707	4.5	66
1ht:	**1239A**				**958A**				**245A**				**2442**		
14:15:00	316	5.8	62	100	247	4.9	69	100	66	1.4	71	100	629	4.0	66
14:30:00	336	6.3	61	100	244	5.0	66	100	61	1.4	69	100	641	4.2	64
14:45:00	390	7.4	60	100	257	5.3	67	100	74	1.7	65	100	721	4.8	63
15:00:00	366	7.0	59	97	227	4.5	69	97	64	1.6	63	97	657	4.3	63
1ht:	**1408A**				**975A**				**265A**				**2648**		
15:15:00	386	7.3	61	97	237	4.7	69	97	89	2.1	64	97	712	4.7	64
15:30:00	383	7.2	60	83	239	4.6	71	83	97	2.3	63	83	719	4.7	64
15:45:00	274	5.0	62	77	203	4.0	70	77	53	1.2	71	77	530	3.4	66
16:00:00	380	7.1	61	87	257	5.3	67	87	67	1.4	72	87	704	4.6	64
1ht:	**1434A**				**940A**				**310A**				**2684**		
16:15:00	439	8.9	56	100	281	5.9	66	100	91	2.0	68	100	811	5.6	61
16:30:00	379	11.8	37	93	254	6.8	51	93	78	1.8	66	93	711	6.8	45
16:45:00	347	7.2	55	83	221	4.8	62	83	67	1.5	70	83	635	4.5	59
17:00:00	363	6.8	61	90	217	4.3	69	90	77	1.9	62	90	657	4.3	64
1ht:	**1537A**				**979A**				**315A**				**2831**		
17:15:00	388	7.6	58	90	263	5.3	68	90	80	1.8	67	90	731	4.9	63
17:30:00	414	8.3	57	100	267	5.5	66	100	92	2.0	70	100	773	5.3	62
17:45:00	372	7.1	60	97	233	4.8	67	97	84	1.9	68	97	689	4.6	63
18:00:00	338	7.2	54	100	242	5.1	65	100	97	2.2	67	100	677	4.8	60
1ht:	**1511A**				**1004A**				**354A**				**2869**		
18:15:00	288	5.4	61	83	184	3.7	68	83	74	1.6	71	83	546	3.6	65
18:30:00	321	6.0	61	93	208	4.2	68	93	76	1.7	70	93	605	3.9	65
18:45:00	318	6.0	60	83	184	3.8	67	83	61	1.4	67	83	563	3.7	63
19:00:00	282	5.2	62	97	193	3.6	74	97	82	1.8	70	97	557	3.5	67
1ht:	**1209A**				**770A**				**295A**				**2274**		
19:15:00	243	4.5	62	90	156	3.1	70	90	53	1.1	73	90	452	2.9	66
19:30:00	166	3.1	61	80	114	2.3	68	80	38	0.8	72	80	318	2.1	65
19:45:00	191	3.6	61	90	130	2.7	67	90	37	0.7	75	90	358	2.3	65
20:00:00	186	3.5	60	100	148	3.0	67	100	53	1.0	80	100	387	2.5	65
1ht:	**789A**				**551A**				**182A**				**1522**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	166	3.3	68	100	251	4.4	87	100	417	3.9	79
06:30:00	211	4.3	67	93	289	4.8	92	93	500	4.6	81
06:45:00	271	5.4	68	100	411	7.1	88	100	682	6.3	80
07:00:00	369	7.8	65	100	524	9.7	82	100	893	8.7	75
1ht:	**1020A**				**1481A**				**2501**		
07:15:00	433	8.9	67	100	559	10.4	82	100	992	9.6	75
07:30:00	442	9.8	62	100	585	11.9	75	100	1027	10.8	69
07:45:00	417	9.0	64	97	547	10.8	77	97	964	9.9	71
08:00:00	437	9.7	62	100	564	11.2	77	100	1001	10.4	70
1ht:	**1729A**				**2256A**				**3985**		
08:15:00	346	7.1	67	97	483	8.7	85	97	829	7.9	77
08:30:00	332	6.8	67	90	472	8.4	86	90	804	7.6	78
08:45:00	329	6.6	68	97	469	8.3	86	97	798	7.5	78
09:00:00	352	7.0	69	100	480	8.5	86	100	832	7.7	79
1ht:	**1360A**				**1904A**				**3264**		
09:15:00	269	5.4	68	100	386	6.6	89	100	655	6.0	80
09:30:00	274	5.6	67	97	364	6.2	89	97	638	5.9	79
09:45:00	286	5.7	68	100	363	6.2	89	100	649	6.0	80
10:00:00	310	6.4	66	97	381	6.6	88	97	691	6.5	78
1ht:	**1139A**				**1494A**				**2633**		
10:15:00	257	5.3	66	100	307	5.1	91	100	564	5.2	80
10:30:00	269	5.7	65	100	362	6.3	88	100	631	6.0	78
10:45:00	271	5.7	65	100	366	6.4	88	100	637	6.0	78
11:00:00	282	5.9	65	100	350	6.2	86	100	632	6.0	77
1ht:	**1079**				**1385**				**2464**		
11:15:00	254	5.1	68	93	288	4.9	90	93	542	5.0	80
11:30:00	275	5.6	67	97	347	6.1	87	97	622	5.8	78
11:45:00	290	5.9	67	100	352	6.1	87	100	642	6.0	78
12:00:00	265	5.6	65	100	341	6.1	85	100	606	5.9	76
1ht:	**1085A**				**1330A**				**2415**		
12:15:00	290	5.9	67	100	354	6.3	85	100	644	6.1	77
12:30:00	287	5.8	68	100	339	6.1	85	100	626	5.9	77
12:45:00	296	6.1	66	97	350	6.1	87	97	646	6.1	77
13:00:00	262	5.4	67	100	352	6.3	85	100	614	5.9	77
1ht:	**1134A**				**1395A**				**2529**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	291	5.8	68	97	361	6.4	86	97	652	6.1	78
13:30:00	287	5.8	67	100	352	6.1	88	100	639	6.0	79
13:45:00	316	6.7	65	100	408	7.2	86	100	724	6.9	77
14:00:00	345	6.8	70	93	432	7.5	87	93	777	7.1	79
1ht:	**1237A**				**1551A**				**2788**		
14:15:00	322	6.5	68	100	435	7.7	86	100	757	7.1	78
14:30:00	343	6.9	68	100	421	7.4	86	100	764	7.2	78
14:45:00	350	7.2	67	100	440	8.0	84	100	790	7.6	76
15:00:00	348	7.2	66	100	498	9.0	84	100	846	8.1	77
1ht:	**1363**				**1794**				**3157**		
15:15:00	352	7.3	66	100	475	8.8	82	100	827	8.0	75
15:30:00	344	7.1	66	93	509	9.3	83	93	853	8.2	76
15:45:00	331	6.7	68	100	444	8.0	85	100	775	7.3	78
16:00:00	328	7.5	60	100	476	9.7	75	100	804	8.6	69
1ht:	**1355A**				**1902A**				**3257**		
16:15:00	325	6.8	66	100	505	9.4	81	100	830	8.1	75
16:30:00	358	8.1	60	100	517	10.4	76	100	875	9.3	69
16:45:00	339	7.4	63	93	514	9.9	79	93	853	8.7	72
17:00:00	347	6.7	70	97	517	9.4	83	97	864	8.1	78
1ht:	**1368A**				**2053A**				**3421**		
17:15:00	390	7.8	68	100	506	9.7	80	100	896	8.7	75
17:30:00	375	8.1	64	100	549	10.9	76	100	924	9.5	71
17:45:00	352	7.2	67	97	489	9.7	77	97	841	8.4	73
18:00:00	349	7.3	65	100	479	9.3	78	100	828	8.3	73
1ht:	**1466A**				**2024A**				**3490**		
18:15:00	319	6.4	68	100	427	7.7	84	100	746	7.1	77
18:30:00	282	5.5	70	93	395	7.0	86	93	677	6.2	79
18:45:00	302	6.2	67	87	426	7.5	87	87	728	6.8	78
19:00:00	261	5.1	70	97	343	5.9	88	97	604	5.5	80
1ht:	**1164A**				**1590A**				**2754**		
19:15:00	247	4.9	68	100	307	5.2	89	100	554	5.1	80
19:30:00	208	4.3	67	100	299	5.2	87	100	507	4.8	78
19:45:00	205	4.2	67	97	274	4.9	85	97	479	4.5	78
20:00:00	194	4.0	66	100	237	4.3	84	100	431	4.2	76
1ht:	**854A**				**1117A**				**1971**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	82	1.5	64	100	83	1.7	55	100	111	1.9	78	100	106	2.1	78	100	382	1.8	70
06:30:00	109	1.9	66	93	81	1.7	56	93	145	2.6	77	93	125	2.5	77	93	460	2.1	71
06:45:00	118	2.1	64	100	108	2.1	59	100	204	3.6	78	100	167	3.2	79	100	597	2.7	72
07:00:00	184	3.2	65	100	145	2.9	57	100	235	4.1	79	100	184	3.6	77	100	748	3.4	71
1ht:	**494A**				**419A**				**697A**				**584A**				**2194**		
07:15:00	208	3.6	67	100	152	2.9	59	100	258	4.6	77	100	197	3.9	77	100	815	3.7	71
07:30:00	227	3.9	67	100	147	2.8	61	100	291	5.0	80	100	242	4.8	77	100	907	4.1	73
07:45:00	191	3.3	66	97	157	2.8	64	97	234	4.1	78	97	237	4.6	78	97	819	3.7	72
08:00:00	226	3.9	66	100	182	3.3	62	100	250	4.3	80	100	221	4.5	75	100	879	4.0	71
1ht:	**853A**				**638A**				**1034A**				**896A**				**3421**		
08:15:00	170	3.1	62	87	151	2.9	59	87	175	3.0	79	87	186	3.8	75	87	682	3.2	69
08:30:00	184	3.1	68	90	152	3.0	58	90	184	3.2	79	90	189	3.8	77	90	709	3.3	71
08:45:00	180	3.0	68	97	151	2.8	61	97	159	2.9	76	97	173	3.4	77	97	663	3.0	71
09:00:00	188	3.4	63	93	141	2.8	57	93	145	2.8	71	93	155	3.3	72	93	629	3.1	66
1ht:	**722A**				**596A**				**662A**				**701A**				**2681**		
09:15:00	163	2.8	68	100	138	2.7	59	100	140	2.3	82	100	145	2.8	78	100	586	2.6	72
09:30:00	150	2.5	69	97	148	3.0	57	97	99	1.8	76	97	145	2.8	78	97	542	2.5	70
09:45:00	127	2.2	65	100	134	2.6	60	100	115	2.0	78	100	143	2.7	80	100	519	2.4	71
10:00:00	140	2.4	68	97	140	2.8	56	97	143	2.5	77	97	132	2.7	75	97	555	2.6	69
1ht:	**580A**				**559A**				**497A**				**565A**				**2201**		
10:15:00	125	2.1	68	100	126	2.5	58	100	101	1.8	78	100	142	2.8	78	100	494	2.3	70
10:30:00	122	2.2	65	90	133	2.9	53	90	103	1.9	74	90	124	2.8	69	90	482	2.4	64
10:45:00	146	2.5	66	100	126	2.5	57	100	124	2.2	76	100	125	2.6	74	100	521	2.5	68
11:00:00	149	2.5	68	100	145	2.9	57	100	111	2.0	75	100	122	2.5	74	100	527	2.5	68
1ht:	**544A**				**530A**				**440A**				**514A**				**2028**		
11:15:00	105	1.8	65	93	118	2.2	60	93	104	1.9	76	93	104	2.0	79	93	431	2.0	70
11:30:00	117	2.0	67	97	144	2.7	61	97	97	1.7	78	97	127	2.6	75	97	485	2.2	70
11:45:00	128	2.2	68	100	137	2.7	59	100	104	1.8	78	100	120	2.3	78	100	489	2.2	70
12:00:00	119	2.0	69	100	142	2.9	57	100	99	1.8	74	100	114	2.2	78	100	474	2.2	69
1ht:	**470A**				**542A**				**404A**				**466A**				**1882**		
12:15:00	129	2.1	69	100	147	3.0	57	100	99	1.8	77	100	142	2.8	77	100	517	2.4	69
12:30:00	137	2.2	70	100	163	3.4	55	100	98	1.7	78	100	126	2.4	80	100	524	2.4	69
12:45:00	152	2.5	70	97	117	2.4	56	97	113	2.0	76	97	136	2.6	80	97	518	2.4	71
13:00:00	130	2.3	65	100	137	2.8	56	100	112	1.9	79	100	137	2.6	80	100	516	2.4	70
1ht:	**548A**				**565A**				**422A**				**541A**				**2076**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	131	2.1	70	97	126	2.5	58	97	110	1.9	80	97	127	2.5	77	97	494	2.2	71
13:30:00	144	2.3	70	100	150	2.9	58	100	97	1.7	80	100	146	2.9	77	100	537	2.5	70
13:45:00	184	3.1	68	100	155	3.2	55	100	126	2.3	75	100	127	2.6	73	100	592	2.8	67
14:00:00	173	2.8	72	93	163	3.1	60	93	115	2.0	80	93	115	2.2	81	93	566	2.5	72
1ht:	**632A**				**594A**				**447A**				**516A**				**2189**		
14:15:00	179	3.0	69	100	163	3.2	58	100	132	2.3	78	100	154	3.0	79	100	628	2.9	71
14:30:00	146	2.5	66	90	158	3.3	55	90	116	2.1	76	90	130	2.5	78	90	550	2.6	68
14:45:00	176	2.9	70	100	165	3.3	58	100	121	2.2	75	100	138	2.8	76	100	600	2.8	69
15:00:00	235	3.9	68	100	194	3.8	58	100	130	2.3	78	100	147	2.9	77	100	706	3.2	69
1ht:	**739A**				**681A**				**499A**				**570A**				**2489**		
15:15:00	211	3.5	69	100	204	4.0	58	100	129	2.3	78	100	142	2.7	79	100	686	3.1	70
15:30:00	233	3.8	70	93	189	3.6	60	93	125	2.2	79	93	145	2.8	78	93	692	3.1	70
15:45:00	197	3.1	72	100	192	3.8	57	100	109	1.9	78	100	146	2.9	77	100	644	2.9	70
16:00:00	212	3.7	65	90	169	3.6	53	90	104	1.9	77	90	121	2.5	75	90	606	2.9	66
1ht:	**851A**				**755A**				**469A**				**555A**				**2630**		
16:15:00	244	4.1	67	100	194	3.7	60	100	106	1.9	78	100	136	2.6	80	100	680	3.1	69
16:30:00	298	4.9	69	100	196	3.8	58	100	122	2.2	77	100	139	2.8	76	100	755	3.4	69
16:45:00	282	4.7	69	93	210	4.2	57	93	126	2.3	75	93	133	2.5	81	93	751	3.4	69
17:00:00	282	4.7	69	97	188	3.5	61	97	106	1.7	83	97	125	2.4	81	97	701	3.1	71
1ht:	**1106A**				**788A**				**459A**				**533A**				**2886**		
17:15:00	275	4.5	69	100	210	4.0	60	100	102	1.8	79	100	140	2.7	80	100	727	3.2	70
17:30:00	304	5.1	68	100	209	4.0	59	100	121	2.2	76	100	153	3.0	79	100	787	3.6	69
17:45:00	256	4.4	66	97	196	3.8	59	97	106	1.9	76	97	122	2.3	82	97	680	3.1	69
18:00:00	213	3.5	69	100	186	3.6	59	100	128	2.2	79	100	142	2.7	81	100	669	3.0	71
1ht:	**1048A**				**801A**				**457A**				**558A**				**2864**		
18:15:00	213	3.5	70	100	164	3.3	57	100	92	1.6	78	100	129	2.5	79	100	598	2.7	70
18:30:00	198	3.3	70	93	145	2.8	59	93	92	1.7	75	93	106	2.0	79	93	541	2.4	70
18:45:00	207	3.4	70	87	167	3.3	57	87	105	1.9	76	87	138	2.7	79	87	617	2.8	69
19:00:00	164	2.6	71	97	119	2.4	57	97	104	1.9	76	97	107	2.0	79	97	494	2.2	71
1ht:	**782A**				**594A**				**393A**				**479A**				**2248**		
19:15:00	160	2.7	69	100	124	2.4	60	100	72	1.2	79	100	93	1.9	74	100	449	2.0	69
19:30:00	140	2.3	68	100	104	2.2	55	100	64	1.2	72	100	78	1.5	77	100	386	1.8	67
19:45:00	143	2.5	66	97	126	2.6	56	97	66	1.2	75	97	80	1.5	80	97	415	1.9	67
20:00:00	118	2.0	68	100	117	2.5	54	100	57	1.0	77	100	80	1.5	81	100	372	1.7	68
1ht:	**561A**				**471A**				**259A**				**331A**				**1622**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	80	2.1	43	93	99	2.4	55	93	75	2.3	50	93	254	2.3	50
06:30:00	113	2.8	46	80	136	3.3	56	80	108	3.0	54	80	357	3.0	52
06:45:00	144	3.7	45	93	135	3.4	54	93	105	2.8	56	93	384	3.3	51
07:00:00	232	5.8	46	100	204	5.0	55	100	128	3.4	58	100	564	4.7	52
1ht:	**579A**				**579A**				**417A**				**1575**		
07:15:00	211	5.2	46	83	206	5.1	56	83	131	3.5	57	83	548	4.6	52
07:30:00	126	3.1	46	53	114	2.7	58	53	101	2.8	56	53	341	2.9	53
07:45:00	257	6.4	46	93	216	5.1	58	93	188	5.2	55	93	661	5.5	53
08:00:00	155	3.8	47	67	135	3.1	59	67	143	3.8	57	67	433	3.6	54
1ht:	**790A**				**708A**				**584A**				**2082**		
08:15:00	172	4.2	47	90	161	3.8	58	90	147	3.9	57	90	480	4.0	54
08:30:00	152	3.7	47	90	144	3.4	59	90	140	3.7	58	90	436	3.6	54
08:45:00	169	4.0	48	83	186	4.3	59	83	145	3.8	59	83	500	4.0	55
09:00:00	184	4.4	48	73	170	4.3	55	73	170	4.6	57	73	524	4.4	53
1ht:	**675A**				**659A**				**599A**				**1933**		
09:15:00	141	3.4	47	87	130	3.4	53	87	112	3.1	54	87	383	3.3	51
09:30:00	141	3.6	45	77	179	4.6	53	77	113	3.1	55	77	433	3.8	51
09:45:00	158	4.0	45	87	175	4.6	53	87	140	4.0	54	87	473	4.2	50
10:00:00	160	3.9	46	73	161	4.2	52	73	150	4.1	56	73	471	4.1	51
1ht:	**599A**				**643A**				**513A**				**1755**		
10:15:00	159	4.0	46	90	197	5.2	52	90	186	4.9	57	90	542	4.7	52
10:30:00	112	2.9	44	83	136	3.8	49	83	112	3.0	58	83	360	3.2	50
10:45:00	88	2.4	43	50	150	4.1	50	50	126	3.4	57	50	364	3.3	51
11:00:00	125	3.2	45	60	155	4.1	51	60	125	3.4	55	60	405	3.6	51
1ht:	**501A**				**647A**				**562A**				**1710**		
11:15:00	137	3.5	45	87	160	4.2	52	87	136	3.7	56	87	433	3.8	51
11:30:00	105	2.6	46	80	125	3.3	51	80	114	2.9	60	80	344	2.9	53
11:45:00	153	4.0	44	80	191	5.0	53	80	176	4.6	59	80	520	4.5	52
12:00:00	176	4.2	48	97	198	5.3	51	97	173	4.6	58	97	547	4.7	52
1ht:	**577A**				**679A**				**602A**				**1858**		
12:15:00	127	3.2	45	83	172	4.5	52	83	164	4.3	58	83	463	4.0	52
12:30:00	145	3.8	44	83	169	4.5	51	83	152	3.8	61	83	466	4.0	52
12:45:00	177	4.3	47	97	230	5.9	53	97	212	5.3	61	97	619	5.2	54
13:00:00	170	4.1	48	100	222	5.8	53	100	213	5.5	59	100	605	5.1	53
1ht:	**625A**				**801A**				**751A**				**2177**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819341

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	205	5.1	46	100	226	6.0	52	100	193	5.0	58	100	624	5.4	52
13:30:00	216	5.2	47	93	246	6.2	54	93	196	5.1	58	93	658	5.5	53
13:45:00	258	6.3	47	100	248	6.3	54	100	215	5.6	58	100	721	6.1	52
14:00:00	261	6.5	46	100	257	6.5	54	100	228	6.0	58	100	746	6.3	52
1ht:	**942A**				**977A**				**833A**				**2752**		
14:15:00	245	6.0	47	100	252	6.5	53	100	246	6.4	58	100	743	6.3	53
14:30:00	263	6.3	47	100	254	6.3	55	100	245	6.4	59	100	762	6.3	54
14:45:00	343	8.4	46	100	296	7.5	54	100	207	5.4	58	100	846	7.1	52
15:00:00	305	7.6	46	100	249	6.1	55	100	203	5.2	60	100	757	6.3	53
1ht:	**1156**				**1051**				**901**				**3108**		
15:15:00	316	7.8	46	100	269	6.6	56	100	194	4.8	61	100	779	6.4	53
15:30:00	349	8.4	48	100	270	6.7	55	100	239	6.1	59	100	858	7.1	53
15:45:00	356	8.6	47	93	299	7.4	56	93	225	5.7	60	93	880	7.2	53
16:00:00	364	9.0	46	100	266	6.5	56	100	219	5.6	60	100	849	7.0	53
1ht:	**1384A**				**1102A**				**877A**				**3363**		
16:15:00	360	8.8	47	100	270	6.8	54	100	222	5.7	59	100	852	7.1	52
16:30:00	351	8.6	47	100	307	7.6	55	100	227	5.7	60	100	885	7.3	53
16:45:00	379	9.3	46	100	306	7.8	54	100	230	6.0	58	100	915	7.7	52
17:00:00	367	8.9	47	100	289	7.2	55	100	214	5.5	59	100	870	7.2	53
1ht:	**1457**				**1172**				**893**				**3522**		
17:15:00	363	8.9	46	100	294	7.3	55	100	264	7.0	57	100	921	7.7	52
17:30:00	351	8.5	47	100	326	8.0	55	100	232	6.1	58	100	909	7.6	53
17:45:00	375	9.3	46	100	284	6.8	57	100	237	6.2	58	100	896	7.4	53
18:00:00	341	8.5	46	100	228	5.6	55	100	283	7.3	59	100	852	7.2	53
1ht:	**1430**				**1132**				**1016**				**3578**		
18:15:00	347	8.5	47	100	264	6.4	56	100	229	5.9	59	100	840	6.9	53
18:30:00	295	7.5	45	100	256	6.5	54	100	253	6.6	58	100	804	6.9	52
18:45:00	299	7.7	44	93	251	6.8	51	93	231	6.1	57	93	781	6.9	50
19:00:00	288	7.6	43	100	236	6.0	53	100	244	6.8	54	100	768	6.8	50
1ht:	**1229A**				**1007A**				**958A**				**3194**		
19:15:00	250	6.5	44	100	203	5.2	54	100	255	7.2	54	100	708	6.3	50
19:30:00	212	5.4	45	100	157	3.7	57	100	242	6.6	56	100	611	5.2	52
19:45:00	174	4.5	44	100	139	3.3	58	100	202	5.2	60	100	515	4.3	54
20:00:00	171	4.4	44	100	155	3.8	57	100	207	5.6	56	100	533	4.6	53
1ht:	**807**				**654**				**906**				**2367**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
07:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
09:30:00	0	0.0	NA	77	0	0.0	NA	77	0	0.0	NA
09:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
10:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
10:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
10:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
10:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
11:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
11:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
11:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
11:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
12:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
12:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
12:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
12:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
13:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819702

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
13:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
13:45:00	0	0.0	NA	80	0	0.0	NA	80	0	0.0	NA
14:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
14:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
14:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
14:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
16:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
19:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
19:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
20:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	123	1.9	90	100	104	2.2	73	100	227	2.0	82
06:30:00	162	2.5	89	90	137	2.7	77	90	299	2.6	83
06:45:00	232	3.5	90	100	149	2.9	77	100	381	3.2	85
07:00:00	285	4.5	88	100	198	3.9	77	100	483	4.2	83
1ht:	**806A**				**589A**				**1395**		
07:15:00	362	5.7	87	93	191	3.8	76	93	553	4.7	83
07:30:00	302	4.6	90	90	220	4.3	78	90	522	4.5	85
07:45:00	374	5.9	87	97	281	5.7	75	97	655	5.8	82
08:00:00	337	5.2	89	90	267	5.1	79	90	604	5.1	85
1ht:	**1378A**				**960A**				**2338**		
08:15:00	241	3.7	89	97	199	3.8	79	97	440	3.8	85
08:30:00	258	3.9	91	100	199	3.8	79	100	457	3.9	86
08:45:00	263	4.1	89	100	219	4.3	78	100	482	4.2	84
09:00:00	277	4.3	87	90	201	4.1	74	90	478	4.2	82
1ht:	**1038A**				**818A**				**1856**		
09:15:00	228	3.6	87	97	183	3.7	75	97	411	3.7	82
09:30:00	227	3.6	86	90	197	3.9	76	90	424	3.8	81
09:45:00	248	3.9	86	97	197	4.1	73	97	445	4.0	81
10:00:00	249	3.9	88	97	219	4.5	75	97	468	4.2	82
1ht:	**953A**				**796A**				**1749**		
10:15:00	213	3.3	87	97	199	4.0	75	97	412	3.7	82
10:30:00	213	3.4	86	93	192	4.1	72	93	405	3.7	79
10:45:00	215	3.4	86	93	209	4.5	71	93	424	4.0	78
11:00:00	230	3.6	87	97	203	4.2	74	97	433	3.9	81
1ht:	**872A**				**802A**				**1674**		
11:15:00	198	3.1	86	97	185	3.8	74	97	383	3.5	80
11:30:00	198	3.1	87	93	190	3.7	79	93	388	3.4	83
11:45:00	196	3.1	86	93	193	3.8	77	93	389	3.5	81
12:00:00	227	3.6	87	100	201	4.0	76	100	428	3.8	81
1ht:	**820A**				**769A**				**1589**		
12:15:00	221	3.5	86	97	206	4.1	76	97	427	3.8	81
12:30:00	179	2.9	86	90	210	4.1	78	90	389	3.5	82
12:45:00	226	3.7	84	97	214	4.3	76	97	440	4.0	80
13:00:00	213	3.4	86	100	221	4.3	78	100	434	3.8	82
1ht:	**841A**				**851A**				**1692**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819710

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	223	3.5	86	100	205	4.2	75	100	428	3.8	81
13:30:00	259	4.1	87	93	245	4.9	76	93	504	4.5	82
13:45:00	283	4.5	86	100	233	4.8	74	100	516	4.6	81
14:00:00	277	4.4	86	100	244	4.8	77	100	521	4.6	82
1ht:	**1042A**				**926A**				**1968**		
14:15:00	292	4.6	86	100	232	4.4	81	100	524	4.5	84
14:30:00	301	4.8	87	100	228	4.5	78	100	529	4.6	83
14:45:00	379	6.2	84	100	288	5.9	74	100	667	6.0	80
15:00:00	360	5.8	84	100	260	5.3	75	100	620	5.6	80
1ht:	**1332**				**1008**				**2340**		
15:15:00	358	5.7	85	100	252	5.0	77	100	610	5.3	82
15:30:00	382	6.2	85	100	272	5.4	76	100	654	5.8	81
15:45:00	371	6.0	85	93	268	5.3	77	93	639	5.6	81
16:00:00	389	6.2	85	100	281	5.6	77	100	670	5.9	82
1ht:	**1500A**				**1073A**				**2573**		
16:15:00	377	6.0	85	100	259	5.1	77	100	636	5.6	82
16:30:00	378	6.1	85	100	264	5.3	76	100	642	5.7	81
16:45:00	420	7.0	83	100	314	6.3	76	100	734	6.6	80
17:00:00	407	6.6	85	100	285	5.4	80	100	692	6.0	83
1ht:	**1582**				**1122**				**2704**		
17:15:00	397	6.3	86	100	276	5.3	79	100	673	5.8	83
17:30:00	376	6.1	84	100	319	6.2	78	100	695	6.1	82
17:45:00	421	7.0	83	100	296	5.7	79	100	717	6.3	81
18:00:00	335	5.3	86	100	271	5.0	82	100	606	5.2	84
1ht:	**1529**				**1162**				**2691**		
18:15:00	382	6.1	85	100	272	5.3	78	100	654	5.7	82
18:30:00	323	5.2	85	100	265	5.1	80	100	588	5.1	83
18:45:00	309	5.1	83	93	250	5.2	73	93	559	5.2	78
19:00:00	275	4.7	81	100	230	4.6	76	100	505	4.6	79
1ht:	**1289A**				**1017A**				**2306**		
19:15:00	260	4.3	82	100	217	4.5	73	100	477	4.4	78
19:30:00	249	4.1	83	100	185	3.8	75	100	434	3.9	79
19:45:00	183	3.0	85	100	173	3.2	81	100	356	3.1	83
20:00:00	178	2.8	86	100	174	3.3	81	100	352	3.1	83
1ht:	**870**				**749**				**1619**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	96	1.7	64	67	83	1.6	72	67	35	0.7	81	67	214	1.3	70
06:30:00	184	3.3	63	70	107	2.2	67	70	34	0.7	79	70	325	2.1	66
06:45:00	305	5.6	62	97	186	3.6	72	97	35	0.7	72	97	526	3.3	66
07:00:00	299	5.6	61	87	186	3.7	68	87	61	1.3	70	87	546	3.6	64
1ht:	**934A**				**589A**				**168A**				**1691**		
07:15:00	302	7.1	49	50	178	4.0	61	50	40	0.8	72	50	520	4.0	55
07:30:00	163	4.6	41	47	126	3.4	51	47	21	0.5	72	47	310	2.8	47
07:45:00	391	10.8	41	90	291	7.6	52	90	62	1.4	68	90	744	6.6	48
08:00:00	285	10.7	30	80	234	7.3	44	80	76	1.7	68	80	595	6.6	41
1ht:	**1211A**				**896A**				**221A**				**2328**		
08:15:00	259	4.7	63	80	184	3.6	70	80	46	1.0	69	80	489	3.1	66
08:30:00	271	4.9	63	77	203	4.0	70	77	39	0.8	77	77	513	3.2	67
08:45:00	304	5.6	62	83	205	3.9	72	83	50	1.1	73	83	559	3.5	67
09:00:00	314	5.9	61	80	179	3.6	68	80	56	1.4	59	80	549	3.6	63
1ht:	**1149A**				**771A**				**193A**				**2113**		
09:15:00	242	4.3	64	67	158	3.1	69	67	48	1.1	67	67	448	2.8	66
09:30:00	267	4.9	62	73	187	3.8	68	73	45	1.0	71	73	499	3.2	65
09:45:00	241	4.4	63	77	190	3.8	68	77	42	0.9	70	77	473	3.0	66
10:00:00	286	5.3	61	87	224	4.4	70	87	47	1.0	72	87	557	3.6	65
1ht:	**1042A**				**767A**				**182A**				**1991**		
10:15:00	257	4.5	66	90	208	4.1	69	90	51	1.1	69	90	516	3.2	67
10:30:00	214	4.0	61	77	140	2.8	68	77	37	0.8	70	77	391	2.5	65
10:45:00	197	3.7	60	83	156	3.2	67	83	43	1.0	68	83	396	2.6	64
11:00:00	222	4.1	62	73	157	3.2	66	73	40	0.8	72	73	419	2.7	65
1ht:	**893A**				**667A**				**172A**				**1732**		
11:15:00	170	3.0	64	73	188	4.0	65	73	40	0.9	66	73	398	2.6	65
11:30:00	189	3.6	60	70	146	2.9	68	70	36	0.7	73	70	371	2.4	65
11:45:00	209	3.9	61	87	172	3.3	70	87	42	0.9	69	87	423	2.7	66
12:00:00	256	4.6	63	90	206	4.1	68	90	46	1.0	72	90	508	3.2	66
1ht:	**835A**				**718A**				**164A**				**1717**		
12:15:00	225	4.2	62	67	179	3.7	66	67	59	1.3	68	67	463	3.1	64
12:30:00	238	4.4	62	80	185	3.7	68	80	56	1.3	65	80	479	3.1	65
12:45:00	272	5.4	58	97	229	4.7	66	97	66	1.5	68	97	567	3.9	62
13:00:00	283	5.2	62	100	216	4.3	68	100	67	1.5	67	100	566	3.7	65
1ht:	**1032A**				**820A**				**250A**				**2102**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819363

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	266	5.0	61	100	222	4.7	64	100	70	1.5	70	100	558	3.7	63
13:30:00	306	5.9	60	93	244	4.9	68	93	87	2.0	67	93	637	4.2	64
13:45:00	345	6.7	59	100	261	5.5	65	100	57	1.3	69	100	663	4.5	62
14:00:00	328	6.1	62	100	251	5.1	68	100	68	1.5	71	100	647	4.2	65
1ht:	**1246A**				**978A**				**281A**				**2505**		
14:15:00	333	6.1	62	100	254	5.2	67	100	82	1.9	67	100	669	4.4	65
14:30:00	389	7.5	59	100	275	5.7	67	100	64	1.3	73	100	728	4.8	63
14:45:00	452	9.0	57	100	279	5.9	64	100	74	1.7	68	100	805	5.5	61
15:00:00	451	10.0	51	100	301	6.7	62	100	103	2.5	62	100	855	6.4	56
1ht:	**1625**				**1109**				**323**				**3057**		
15:15:00	423	8.1	60	100	255	5.1	68	100	94	2.2	65	100	772	5.1	63
15:30:00	430	8.2	60	100	295	6.2	66	100	78	1.8	65	100	803	5.4	62
15:45:00	464	9.0	59	93	283	5.7	68	93	88	2.0	65	93	835	5.6	62
16:00:00	438	8.4	60	100	258	5.2	68	100	82	1.9	67	100	778	5.1	63
1ht:	**1753A**				**1090A**				**342A**				**3185**		
16:15:00	426	8.1	60	100	253	5.1	68	100	101	2.3	67	100	780	5.2	63
16:30:00	425	8.4	57	100	280	5.7	67	100	81	1.8	67	100	786	5.3	62
16:45:00	469	9.0	59	100	293	6.0	67	100	91	2.0	70	100	853	5.6	63
17:00:00	451	8.4	61	100	277	5.6	68	100	109	2.5	67	100	837	5.5	64
1ht:	**1771**				**1103**				**382**				**3256**		
17:15:00	448	8.4	61	100	302	5.9	70	100	83	1.7	73	100	833	5.3	66
17:30:00	421	8.1	59	100	267	5.3	69	100	96	2.2	66	100	784	5.2	63
17:45:00	420	7.9	61	100	290	5.7	69	100	102	2.2	72	100	812	5.3	65
18:00:00	418	7.9	61	100	259	5.3	67	100	78	1.6	73	100	755	4.9	64
1ht:	**1707**				**1118**				**359**				**3184**		
18:15:00	397	7.6	60	100	261	5.2	69	100	74	1.6	69	100	732	4.8	64
18:30:00	375	7.1	60	100	264	5.3	69	100	70	1.6	69	100	709	4.6	64
18:45:00	385	7.6	58	93	251	5.3	65	93	56	1.3	68	93	692	4.7	61
19:00:00	338	6.6	59	100	231	4.7	67	100	66	1.5	66	100	635	4.3	63
1ht:	**1494A**				**1007A**				**266A**				**2767**		
19:15:00	283	5.3	61	100	216	4.3	69	100	59	1.3	71	100	558	3.6	65
19:30:00	272	4.9	63	100	184	3.6	69	100	38	0.7	78	100	494	3.1	66
19:45:00	211	3.9	61	100	157	3.1	70	100	44	1.0	68	100	412	2.7	65
20:00:00	214	4.0	61	100	156	3.1	69	100	40	0.8	73	100	410	2.7	65
1ht:	**980**				**713**				**181**				**1874**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	169	3.3	71	100	248	4.3	87	100	417	3.8	81
06:30:00	188	3.6	71	90	274	4.7	90	90	462	4.2	82
06:45:00	290	5.5	72	100	427	7.3	89	100	717	6.4	82
07:00:00	388	8.1	66	100	527	9.6	83	100	915	8.8	76
1ht:	**1042A**				**1486A**				**2528**		
07:15:00	410	8.3	68	93	564	10.4	82	93	974	9.3	76
07:30:00	425	9.6	61	87	555	11.6	73	87	980	10.6	68
07:45:00	438	9.3	64	97	566	10.8	80	97	1004	10.1	73
08:00:00	447	10.0	61	90	546	11.0	75	90	993	10.5	69
1ht:	**1719A**				**2231A**				**3950**		
08:15:00	333	6.8	67	97	452	8.2	84	97	785	7.5	77
08:30:00	319	6.2	70	100	440	7.5	89	100	759	6.9	81
08:45:00	312	6.2	69	100	434	7.6	87	100	746	6.9	79
09:00:00	333	6.7	68	87	438	8.1	83	87	771	7.4	77
1ht:	**1296A**				**1765A**				**3061**		
09:15:00	280	5.5	70	97	400	6.9	88	97	680	6.2	80
09:30:00	280	5.8	66	90	401	7.0	87	90	681	6.4	78
09:45:00	311	6.5	66	97	390	7.1	83	97	701	6.8	75
10:00:00	332	6.6	69	97	408	7.3	85	97	740	6.9	78
1ht:	**1205A**				**1599A**				**2804**		
10:15:00	286	5.8	68	97	337	5.7	89	97	623	5.7	80
10:30:00	267	5.6	66	93	344	6.0	87	93	611	5.8	77
10:45:00	253	5.3	66	93	325	5.7	87	93	578	5.5	77
11:00:00	292	6.1	65	97	384	6.8	86	97	676	6.5	77
1ht:	**1098A**				**1391A**				**2489**		
11:15:00	277	5.8	65	97	306	5.4	87	97	583	5.6	77
11:30:00	264	5.4	66	93	328	5.6	89	93	592	5.5	79
11:45:00	265	5.3	68	93	314	5.3	91	93	579	5.3	80
12:00:00	307	6.2	68	100	354	6.2	87	100	661	6.2	78
1ht:	**1114A**				**1303A**				**2417**		
12:15:00	261	5.4	66	97	335	5.9	87	97	596	5.6	78
12:30:00	317	6.6	66	90	361	6.3	88	90	678	6.4	77
12:45:00	290	6.1	65	97	339	6.1	85	97	629	6.1	76
13:00:00	288	5.7	69	100	354	6.0	90	100	642	5.8	81
1ht:	**1153A**				**1389A**				**2542**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819716

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	276	6.0	63	100	383	6.7	87	100	659	6.3	77
13:30:00	312	6.3	68	93	366	6.3	89	93	678	6.3	79
13:45:00	295	5.9	68	100	434	7.6	86	100	729	6.8	79
14:00:00	317	6.6	66	100	393	6.7	90	100	710	6.6	79
1ht:	**1199A**				**1578A**				**2777**		
14:15:00	316	6.5	67	100	402	6.9	88	100	718	6.7	79
14:30:00	352	7.1	68	100	444	7.7	88	100	796	7.4	79
14:45:00	357	7.5	66	100	502	8.8	86	100	859	8.1	78
15:00:00	423	9.5	61	100	513	10.2	76	100	936	9.9	69
1ht:	**1448**				**1861**				**3309**		
15:15:00	364	7.5	66	100	487	8.7	85	100	851	8.1	77
15:30:00	390	8.1	66	100	498	9.2	83	100	888	8.6	75
15:45:00	396	8.4	64	93	497	9.0	84	93	893	8.7	75
16:00:00	356	7.0	70	100	531	9.3	87	100	887	8.1	80
1ht:	**1505A**				**2014A**				**3519**		
16:15:00	342	6.8	69	100	491	8.5	88	100	833	7.7	80
16:30:00	357	7.2	68	100	513	9.2	84	100	870	8.2	78
16:45:00	373	7.7	66	100	553	10.0	84	100	926	8.9	77
17:00:00	360	7.3	68	100	536	9.7	84	100	896	8.5	78
1ht:	**1432**				**2093**				**3525**		
17:15:00	365	7.5	67	100	547	9.9	84	100	912	8.7	77
17:30:00	410	8.7	65	100	536	10.2	80	100	946	9.4	74
17:45:00	358	7.2	68	100	506	9.1	85	100	864	8.1	78
18:00:00	345	6.9	68	100	491	8.6	87	100	836	7.7	79
1ht:	**1478**				**2080**				**3558**		
18:15:00	329	6.6	69	100	470	8.2	87	100	799	7.4	79
18:30:00	340	6.6	71	100	459	8.2	85	100	799	7.4	79
18:45:00	349	7.3	65	93	446	8.5	80	93	795	7.9	74
19:00:00	326	6.7	67	100	409	7.2	86	100	735	7.0	78
1ht:	**1343A**				**1784A**				**3127**		
19:15:00	277	5.7	66	100	332	5.7	89	100	609	5.7	78
19:30:00	247	5.0	68	100	324	5.5	90	100	571	5.2	80
19:45:00	197	3.8	72	100	269	4.5	90	100	466	4.1	83
20:00:00	196	3.9	69	100	257	4.2	93	100	453	4.0	83
1ht:	**917**				**1182**				**2099**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	75	1.3	68	100	66	1.3	56	100	118	2.0	79	100	115	2.1	84	100	374	1.7	74
06:30:00	106	1.8	68	90	84	1.8	55	90	126	2.2	79	90	137	2.6	81	90	453	2.1	72
06:45:00	140	2.2	71	100	103	2.1	57	100	230	4.0	78	100	178	3.4	79	100	651	2.9	74
07:00:00	178	2.9	70	100	121	2.3	59	100	249	4.3	80	100	192	3.8	78	100	740	3.3	74
1ht:	**501A**				**375A**				**728A**				**624A**				**2228**		
07:15:00	196	3.2	69	93	158	3.1	58	93	248	4.3	78	93	184	3.5	80	93	786	3.5	72
07:30:00	205	3.5	67	83	142	2.9	56	83	262	4.7	76	83	227	4.8	72	83	836	4.0	69
07:45:00	227	3.7	70	97	162	3.0	61	97	278	4.7	81	97	251	4.9	78	97	918	4.1	74
08:00:00	221	3.5	71	90	167	3.0	63	90	251	4.3	79	90	231	4.4	80	90	870	3.8	74
1ht:	**850A**				**630A**				**1039A**				**894A**				**3413**		
08:15:00	164	2.6	71	97	132	2.6	59	97	193	3.2	83	97	185	3.6	78	97	674	3.0	74
08:30:00	181	2.9	72	90	129	2.5	58	90	150	2.6	80	90	177	3.5	77	90	637	2.9	73
08:45:00	156	2.6	67	87	133	2.6	59	87	128	2.2	80	87	174	3.3	79	87	591	2.7	72
09:00:00	173	2.8	70	80	154	3.1	57	80	153	2.7	76	80	136	2.7	76	80	616	2.8	70
1ht:	**674A**				**546A**				**628A**				**677A**				**2525**		
09:15:00	177	3.0	68	87	122	2.6	53	87	120	2.2	76	87	145	2.9	76	87	564	2.7	69
09:30:00	114	2.1	62	63	134	2.9	53	63	112	2.2	70	63	109	2.3	71	63	469	2.4	63
09:45:00	134	2.2	70	90	143	2.9	56	90	130	2.3	78	90	142	3.1	71	90	549	2.6	69
10:00:00	144	2.5	65	93	141	3.1	53	93	119	2.2	76	93	141	2.7	79	93	545	2.6	68
1ht:	**576A**				**542A**				**484A**				**546A**				**2148**		
10:15:00	134	2.2	70	97	127	2.5	59	97	112	2.0	78	97	129	2.5	79	97	502	2.3	71
10:30:00	97	1.8	62	70	110	2.3	54	70	96	1.7	75	70	109	2.3	71	70	412	2.0	65
10:45:00	109	1.9	66	90	114	2.4	53	90	94	1.8	72	90	113	2.3	74	90	430	2.1	66
11:00:00	130	2.4	61	60	108	2.6	47	60	90	1.9	65	60	98	2.6	58	60	426	2.4	58
1ht:	**472A**				**465A**				**397A**				**457A**				**1791**		
11:15:00	64	1.3	55	57	76	2.0	44	57	65	1.6	55	57	67	1.6	63	57	272	1.6	54
11:30:00	136	2.3	69	93	135	2.8	55	93	92	1.6	79	93	111	2.1	80	93	474	2.2	69
11:45:00	121	2.1	67	93	137	2.6	60	93	108	1.9	80	93	126	2.4	81	93	492	2.2	71
12:00:00	142	2.3	70	100	156	3.1	58	100	94	1.6	79	100	143	2.7	80	100	535	2.4	71
1ht:	**487A**				**528A**				**370A**				**470A**				**1855**		
12:15:00	157	2.6	69	97	130	2.6	56	97	78	1.4	77	97	119	2.3	79	97	484	2.2	69
12:30:00	154	2.6	69	90	131	2.6	58	90	92	1.7	76	90	134	2.6	79	90	511	2.3	70
12:45:00	139	2.3	68	97	137	2.8	55	97	101	1.9	75	97	124	2.5	74	97	501	2.4	67
13:00:00	144	2.3	70	100	141	2.8	58	100	98	1.6	82	100	122	2.3	79	100	505	2.3	71
1ht:	**594A**				**539A**				**369A**				**499A**				**2001**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 20:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-E, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819723

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML 4 VOL	ML 4 OCC	ML 4 SPD	ML 4 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
13:15:00	152	2.6	66	100	148	3.0	56	100	121	2.2	74	100	127	2.6	74	100	548	2.6	67
13:30:00	138	2.5	64	90	134	2.9	54	90	107	2.0	73	90	126	2.6	73	90	505	2.5	65
13:45:00	186	3.2	66	100	173	3.4	57	100	102	1.8	77	100	150	2.9	79	100	611	2.8	69
14:00:00	176	2.9	70	100	157	3.1	58	100	88	1.5	79	100	131	2.5	78	100	552	2.5	70
1ht:	**654A**				**614A**				**417A**				**534A**				**2219**		
14:15:00	152	2.4	71	90	159	3.0	60	90	114	1.9	81	90	126	2.6	75	90	551	2.5	71
14:30:00	150	2.8	62	90	161	3.4	54	90	78	1.5	73	90	114	2.5	69	90	503	2.5	63
14:45:00	222	3.9	66	97	190	3.9	56	97	124	2.3	75	97	161	3.2	76	97	697	3.3	67
15:00:00	252	4.2	68	100	212	4.0	60	100	149	2.7	77	100	168	3.3	77	100	781	3.5	70
1ht:	**785A**				**726A**				**469A**				**573A**				**2553**		
15:15:00	202	3.6	64	87	164	3.4	55	87	135	2.6	72	87	122	2.6	71	87	623	3.0	65
15:30:00	216	3.6	69	100	205	3.9	60	100	128	2.1	83	100	150	3.0	77	100	699	3.1	71
15:45:00	226	3.8	67	87	200	3.9	58	87	144	2.6	76	87	134	2.7	77	87	704	3.3	68
16:00:00	238	4.2	64	87	167	3.3	58	87	115	2.2	72	87	135	3.0	68	87	655	3.2	65
1ht:	**881A**				**739A**				**522A**				**543A**				**2685**		
16:15:00	236	3.9	70	100	208	3.8	62	100	111	1.9	80	100	126	2.4	80	100	681	3.0	71
16:30:00	255	4.1	71	100	209	3.8	63	100	106	1.8	81	100	126	2.3	82	100	696	3.0	72
16:45:00	291	4.8	69	100	217	4.1	60	100	137	2.3	80	100	141	2.6	84	100	786	3.5	71
17:00:00	274	4.4	71	100	225	4.1	63	100	114	2.0	80	100	146	2.7	81	100	759	3.3	72
1ht:	**1056**				**859**				**468**				**539**				**2922**		
17:15:00	262	4.4	68	100	225	4.2	61	100	111	1.9	82	100	141	2.6	81	100	739	3.3	70
17:30:00	334	5.6	68	100	190	3.6	60	100	116	2.0	79	100	158	3.0	81	100	798	3.5	70
17:45:00	267	4.3	71	100	200	3.8	60	100	108	1.9	77	100	133	2.4	83	100	708	3.1	71
18:00:00	249	4.1	70	100	185	3.4	63	100	109	1.8	81	100	142	2.7	81	100	685	3.0	72
1ht:	**1112**				**800**				**444**				**574**				**2930**		
18:15:00	246	4.2	67	100	165	3.1	61	100	110	1.9	80	100	150	2.9	80	100	671	3.0	71
18:30:00	217	3.6	68	100	195	3.6	61	100	118	2.0	81	100	135	2.5	83	100	665	2.9	71
18:45:00	214	3.7	66	93	171	3.4	57	93	99	1.8	77	93	119	2.4	77	93	603	2.8	67
19:00:00	192	3.3	66	100	167	3.2	59	100	92	1.6	79	100	134	2.6	79	100	585	2.7	69
1ht:	**869A**				**699A**				**419A**				**539A**				**2526**		
19:15:00	161	2.8	65	100	131	2.6	57	100	80	1.5	72	100	95	1.8	79	100	467	2.2	67
19:30:00	155	2.6	69	100	148	2.9	59	100	78	1.4	79	100	98	1.9	81	100	479	2.2	70
19:45:00	132	2.2	68	100	120	2.3	59	100	64	1.2	75	100	77	1.4	85	100	393	1.8	70
20:00:00	120	2.0	67	100	118	2.3	57	100	53	0.9	80	100	79	1.4	83	100	370	1.7	69
1ht:	**568**				**517**				**275**				**349**				**1709**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	80	1.5	60	100	171	3.1	74	100	131	2.9	68	100	382	2.5	69
06:30:00	126	2.5	59	100	202	3.7	75	100	129	2.9	68	100	457	3.0	68
06:45:00	159	3.0	61	100	266	4.8	75	100	172	3.8	69	100	597	3.9	70
07:00:00	202	3.8	61	100	331	5.8	78	100	224	4.8	70	100	757	4.8	71
1ht:	**567**				**970**				**656**				**2193**		
07:15:00	235	4.4	61	100	340	5.8	80	100	258	5.4	73	100	833	5.2	72
07:30:00	213	4.1	60	100	312	5.4	79	100	256	5.5	71	100	781	5.0	71
07:45:00	243	4.7	59	100	353	6.3	77	100	272	5.8	71	100	868	5.6	70
08:00:00	207	3.8	62	100	316	5.5	79	100	261	5.7	69	100	784	5.0	71
1ht:	**898**				**1321**				**1047**				**3266**		
08:15:00	164	3.0	62	100	276	4.8	79	100	222	4.7	71	100	662	4.2	72
08:30:00	148	2.8	60	100	289	5.2	76	100	221	4.8	70	100	658	4.3	71
08:45:00	119	2.2	61	100	228	4.0	78	100	213	4.5	71	100	560	3.6	72
09:00:00	130	2.5	60	100	230	4.0	78	100	230	4.7	75	100	590	3.7	73
1ht:	**561**				**1023**				**886**				**2470**		
09:15:00	94	1.8	60	100	212	3.7	78	100	191	4.1	71	100	497	3.2	72

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-16-2012 06:00:00** **TO:** **10-16-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	111	2.4	62	100	154	2.6	90	100	265	2.5	79
06:30:00	149	3.2	65	100	245	4.1	91	100	394	3.6	81
06:45:00	173	4.0	60	100	301	5.3	87	100	474	4.6	77
07:00:00	210	4.3	67	100	383	6.5	90	100	593	5.4	82
1ht:	**643**				**1083**				**1726**		
07:15:00	223	4.4	70	100	355	5.8	94	100	578	5.1	84
07:30:00	237	5.1	64	100	449	7.7	88	100	686	6.4	80
07:45:00	237	5.0	65	100	457	7.9	88	100	694	6.4	80
08:00:00	234	4.7	68	100	426	7.2	90	100	660	6.0	82
1ht:	**931**				**1687**				**2618**		
08:15:00	222	4.6	66	100	357	6.0	90	100	579	5.3	81
08:30:00	219	4.7	64	100	365	6.3	88	100	584	5.5	79
08:45:00	211	4.3	67	100	325	5.5	90	100	536	4.9	81
09:00:00	212	4.3	68	100	284	4.7	91	100	496	4.5	81
1ht:	**864**				**1331**				**2195**		
09:15:00	177	3.5	69	100	242	4.0	92	100	419	3.8	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	156	3.6	49	100	101	3.0	47	100	49	1.5	49	100	306	2.7	48
06:30:00	231	5.4	49	100	129	3.5	50	100	53	1.8	45	100	413	3.6	49
06:45:00	286	6.6	50	100	135	3.7	51	100	99	3.1	48	100	520	4.4	50
07:00:00	351	8.1	50	100	177	4.6	53	100	81	2.4	51	100	609	5.0	51
1ht:	**1024**				**542**				**282**				**1848**		
07:15:00	336	7.6	50	100	181	4.9	51	100	87	2.6	50	100	604	5.0	50
07:30:00	411	9.3	50	100	221	5.8	52	100	83	2.6	48	100	715	5.9	51
07:45:00	419	9.5	50	100	228	5.7	55	100	82	2.3	55	100	729	5.8	52
08:00:00	384	8.8	50	100	229	5.9	53	100	97	2.7	55	100	710	5.8	51
1ht:	**1550**				**859**				**349**				**2758**		
08:15:00	338	7.7	50	100	224	5.8	53	100	67	1.7	60	100	629	5.1	52
08:30:00	343	7.8	50	100	197	4.9	55	100	88	2.5	54	100	628	5.1	52
08:45:00	326	7.5	50	100	195	4.9	55	100	91	2.4	57	100	612	4.9	52
09:00:00	287	6.6	50	100	205	5.0	56	100	64	1.8	53	100	556	4.5	52
1ht:	**1294**				**821**				**310**				**2425**		
09:15:00	233	5.3	50	100	173	4.4	54	100	39	1.1	56	100	445	3.6	52

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	181	2.7	92	100	158	3.1	77	100	339	2.9	85
06:30:00	252	3.7	94	100	180	3.4	80	100	432	3.5	88
06:45:00	331	4.9	93	100	206	4.1	77	100	537	4.5	87
07:00:00	401	5.9	94	100	260	5.0	79	100	661	5.4	88
1ht:	**1165**				**804**				**1969**		
07:15:00	420	6.2	93	100	281	5.5	78	100	701	5.9	87
07:30:00	491	7.5	90	100	316	6.2	78	100	807	6.8	85
07:45:00	484	7.3	91	100	295	5.8	77	100	779	6.6	86
08:00:00	455	7.0	89	100	345	6.8	77	100	800	6.9	84
1ht:	**1850**				**1237**				**3087**		
08:15:00	387	5.9	90	100	307	6.1	76	100	694	6.0	84
08:30:00	422	6.4	91	100	298	6.0	76	100	720	6.2	85
08:45:00	357	5.3	93	100	258	5.0	78	100	615	5.1	87
09:00:00	333	4.9	93	100	250	4.9	78	100	583	4.9	86
1ht:	**1499**				**1113**				**2612**		
09:15:00	275	4.1	92	100	240	4.6	79	100	515	4.4	86

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 06:00:00 **TO:** 10-16-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	101	1.6	72	100	140	2.7	72	100	43	0.9	70	100	284	1.7	71
06:30:00	167	2.7	71	100	180	3.6	69	100	64	1.4	69	100	411	2.5	70
06:45:00	226	3.8	68	100	214	4.2	70	100	56	1.2	70	100	496	3.1	69
07:00:00	255	4.0	73	100	244	4.7	72	100	89	1.9	72	100	588	3.5	72
1ht:	**749**				**778**				**252**				**1779**		
07:15:00	252	3.9	73	100	249	4.8	71	100	103	2.0	78	100	604	3.6	73
07:30:00	317	4.9	73	100	270	5.2	72	100	100	2.0	75	100	687	4.0	73
07:45:00	284	4.4	74	100	241	4.6	72	100	69	1.4	75	100	594	3.4	73
08:00:00	288	4.5	74	100	277	5.2	72	100	82	1.7	73	100	647	3.8	73
1ht:	**1141**				**1037**				**354**				**2532**		
08:15:00	229	3.6	72	100	271	5.3	70	100	87	1.7	76	100	587	3.6	72
08:30:00	238	3.7	74	100	238	4.6	72	100	81	1.7	74	100	557	3.3	73
08:45:00	196	3.0	76	100	237	4.4	74	100	63	1.3	77	100	496	2.9	75
09:00:00	195	3.0	75	100	219	4.1	73	100	62	1.2	77	100	476	2.8	74
1ht:	**858**				**965**				**293**				**2116**		
09:15:00	149	2.3	74	100	201	3.8	72	100	58	1.2	72	100	408	2.4	73

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	110	2.2	56	100	182	3.2	77	100	152	3.4	69	100	444	2.9	69
06:30:00	139	2.7	60	100	238	4.4	75	100	170	3.7	69	100	547	3.6	69
06:45:00	190	3.7	59	100	276	5.0	76	100	171	4.0	65	100	637	4.2	68
07:00:00	227	4.2	61	100	353	6.1	80	100	239	5.1	71	100	819	5.1	72
1ht:	**666**				**1049**				**732**				**2447**		
07:15:00	215	4.1	59	100	288	4.9	81	100	247	5.2	72	100	750	4.7	72
07:30:00	219	4.3	59	100	345	6.0	79	100	268	5.6	73	100	832	5.3	71
07:45:00	241	4.6	60	100	355	6.0	81	100	258	5.7	69	100	854	5.4	71
08:00:00	219	4.2	60	100	354	6.2	79	100	261	5.8	68	100	834	5.4	70
1ht:	**894**				**1342**				**1034**				**3270**		
08:15:00	156	3.0	60	100	293	5.1	78	100	242	5.1	72	100	691	4.4	72
08:30:00	160	3.0	60	100	301	5.3	78	100	235	5.0	71	100	696	4.5	71
08:45:00	183	3.6	59	100	309	5.4	78	100	264	5.8	69	100	756	4.9	70
09:00:00	153	3.0	59	100	244	4.3	78	100	216	4.6	71	100	613	4.0	70
1ht:	**652**				**1147**				**957**				**2756**		
09:15:00	100	1.9	60	100	219	4.0	76	100	197	4.2	71	100	516	3.3	71

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	121	2.6	63	100	159	2.7	89	100	280	2.7	77
06:30:00	136	2.9	64	100	230	3.8	92	100	366	3.4	81
06:45:00	173	3.9	61	100	292	5.0	88	100	465	4.5	78
07:00:00	219	4.3	70	100	392	6.6	91	100	611	5.4	83
1ht:	**649**				**1073**				**1722**		
07:15:00	194	3.9	69	100	376	6.2	93	100	570	5.0	85
07:30:00	236	4.8	67	100	417	7.1	89	100	653	6.0	81
07:45:00	243	4.9	67	100	447	7.6	89	100	690	6.3	82
08:00:00	261	5.8	61	100	451	8.0	86	100	712	6.9	77
1ht:	**934**				**1691**				**2625**		
08:15:00	218	4.6	65	100	359	6.2	88	100	577	5.4	79
08:30:00	225	4.8	64	100	362	6.1	90	100	587	5.5	80
08:45:00	225	4.7	66	100	372	6.3	89	100	597	5.5	81
09:00:00	211	4.2	69	100	304	5.1	90	100	515	4.6	82
1ht:	**879**				**1397**				**2276**		
09:15:00	183	3.6	69	100	221	3.6	93	100	404	3.6	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	132	3.0	50	100	97	2.8	47	100	40	1.2	49	100	269	2.4	49
06:30:00	199	4.6	49	100	108	3.0	49	100	47	1.4	51	100	354	3.0	49
06:45:00	237	5.5	50	100	147	4.0	51	100	71	2.2	49	100	455	3.9	50
07:00:00	318	7.2	50	100	185	4.9	52	100	75	2.2	53	100	578	4.8	51
1ht:	**886**				**537**				**233**				**1656**		
07:15:00	319	7.2	51	100	169	4.6	50	100	68	1.9	54	100	556	4.6	51
07:30:00	337	7.7	50	100	179	4.8	51	100	78	2.2	54	100	594	4.9	51
07:45:00	399	9.1	50	100	230	5.7	55	100	78	2.2	53	100	707	5.7	52
08:00:00	356	8.2	50	100	194	4.9	54	100	98	2.7	56	100	648	5.2	52
1ht:	**1411**				**772**				**322**				**2505**		
08:15:00	297	6.8	50	100	163	4.1	55	100	68	2.0	53	100	528	4.3	52
08:30:00	299	6.9	49	100	194	4.9	54	100	88	2.3	58	100	581	4.7	52
08:45:00	309	7.1	49	100	205	5.4	52	100	77	2.1	56	100	591	4.9	51
09:00:00	267	6.1	50	100	180	4.6	54	100	65	1.7	58	100	512	4.1	52
1ht:	**1172**				**742**				**298**				**2212**		
09:15:00	226	5.2	50	100	163	4.2	54	100	60	1.6	56	100	449	3.7	52

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	180	2.7	92	100	158	3.1	77	100	338	2.9	85
06:30:00	246	3.6	94	100	164	3.1	80	100	410	3.4	88
06:45:00	304	4.5	93	100	224	4.2	82	100	528	4.3	88
07:00:00	428	6.4	91	100	272	5.2	79	100	700	5.8	87
1ht:	**1158**				**818**				**1976**		
07:15:00	434	6.5	92	100	285	5.5	78	100	719	6.0	87
07:30:00	442	6.6	91	100	300	5.6	82	100	742	6.1	87
07:45:00	496	7.5	90	100	313	6.2	77	100	809	6.9	85
08:00:00	499	7.6	90	100	311	6.4	74	100	810	7.0	84
1ht:	**1871**				**1209**				**3080**		
08:15:00	418	6.5	88	100	296	6.1	74	100	714	6.3	82
08:30:00	413	6.3	90	100	280	5.7	75	100	693	6.0	84
08:45:00	408	6.4	87	100	282	5.9	73	100	690	6.1	81
09:00:00	348	5.2	91	100	237	4.7	77	100	585	4.9	85
1ht:	**1587**				**1095**				**2682**		
09:15:00	282	4.2	91	100	242	4.6	79	100	524	4.4	86

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 06:00:00 **TO:** 10-17-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	119	2.0	69	100	145	2.8	70	100	40	0.9	70	100	304	1.9	70
06:30:00	144	2.4	69	97	148	2.9	71	97	52	1.1	70	97	344	2.1	70
06:45:00	202	3.3	71	100	225	4.3	72	100	54	1.1	75	100	481	2.9	72
07:00:00	256	4.0	72	100	257	4.8	74	100	87	1.7	77	100	600	3.5	74
1ht:	**722A**				**776A**				**233A**				**1731**		
07:15:00	251	4.1	70	90	244	4.7	72	90	101	2.1	74	90	596	3.6	71
07:30:00	246	3.9	72	100	236	4.3	76	100	81	1.7	75	100	563	3.3	74
07:45:00	269	4.2	72	100	271	5.0	74	100	64	1.3	76	100	604	3.5	73
08:00:00	323	5.1	73	100	250	4.8	71	100	82	1.8	70	100	655	3.9	72
1ht:	**1091A**				**1002A**				**326A**				**2419**		
08:15:00	250	4.2	67	97	207	4.3	66	97	83	1.9	67	97	540	3.5	67
08:30:00	253	4.0	72	100	268	5.2	71	100	77	1.6	72	100	598	3.6	72
08:45:00	214	3.6	69	77	226	4.7	65	77	57	1.2	72	77	497	3.2	68
09:00:00	194	3.0	74	100	220	4.1	73	100	67	1.3	78	100	481	2.8	74
1ht:	**914A**				**923A**				**287A**				**2124**		
09:15:00	141	2.2	74	100	213	3.9	74	100	51	1.0	81	100	405	2.4	75

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	104	2.1	57	100	196	3.6	75	100	167	3.7	69	100	467	3.1	69
06:30:00	144	2.9	57	100	240	4.2	78	100	165	3.6	69	100	549	3.6	70
06:45:00	212	4.2	58	100	292	5.2	76	100	190	4.2	68	100	694	4.5	69
07:00:00	206	3.9	60	100	315	5.3	81	100	214	4.5	72	100	735	4.6	72
1ht:	**666**				**1043**				**736**				**2445**		
07:15:00	214	4.2	58	100	329	5.7	79	100	220	4.7	72	100	763	4.9	71
07:30:00	264	5.0	60	100	371	6.4	79	100	309	6.7	70	100	944	6.0	71
07:45:00	255	4.9	60	100	367	6.5	78	100	313	6.6	73	100	935	6.0	71
08:00:00	244	4.6	61	100	351	6.0	81	100	305	6.5	72	100	900	5.7	72
1ht:	**977**				**1418**				**1147**				**3542**		
08:15:00	172	3.2	62	100	300	5.1	81	100	284	6.3	69	100	756	4.8	72
08:30:00	170	3.3	59	100	290	5.2	76	100	249	5.8	65	100	709	4.8	68
08:45:00	164	3.1	60	100	256	4.5	78	100	244	5.3	71	100	664	4.3	71
09:00:00	153	2.9	59	100	255	4.4	79	100	230	5.0	70	100	638	4.1	71
1ht:	**659**				**1101**				**1007**				**2767**		
09:15:00	101	1.9	61	100	207	3.6	79	100	194	4.2	70	100	502	3.2	72

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-18-2012 06:00:00** **TO:** **10-18-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	103	2.2	64	100	168	2.8	90	100	271	2.5	80
06:30:00	142	2.9	67	100	239	4.0	91	100	381	3.5	82
06:45:00	173	3.8	62	100	320	5.5	88	100	493	4.7	79
07:00:00	196	3.9	68	100	331	5.4	92	100	527	4.7	83
1ht:	**614**				**1058**				**1672**		
07:15:00	218	4.5	66	100	378	6.4	89	100	596	5.5	81
07:30:00	256	5.2	67	100	416	7.1	89	100	672	6.2	81
07:45:00	236	5.0	64	100	454	7.6	90	100	690	6.3	81
08:00:00	253	5.2	66	100	434	7.4	90	100	687	6.3	81
1ht:	**963**				**1682**				**2645**		
08:15:00	223	4.7	65	100	365	6.1	91	100	588	5.4	81
08:30:00	202	4.3	64	100	336	5.6	91	100	538	5.0	81
08:45:00	218	4.5	66	100	307	5.2	91	100	525	4.8	80
09:00:00	205	4.3	65	100	257	4.3	91	100	462	4.3	80
1ht:	**848**				**1265**				**2113**		
09:15:00	156	3.4	63	100	226	3.8	91	100	382	3.6	79

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	152	3.7	47	100	100	2.9	47	100	38	1.4	43	100	290	2.6	47
06:30:00	221	5.1	49	100	128	3.8	46	100	48	1.6	45	100	397	3.5	48
06:45:00	269	6.1	50	100	125	3.7	47	100	85	2.8	46	100	479	4.2	48
07:00:00	319	7.2	50	100	162	4.5	49	100	61	1.7	54	100	542	4.5	50
1ht:	**961**				**515**				**232**				**1708**		
07:15:00	346	7.9	50	100	194	5.2	51	100	77	2.3	50	100	617	5.2	50
07:30:00	368	8.4	50	100	193	5.2	51	100	95	2.8	53	100	656	5.5	50
07:45:00	401	9.2	50	100	204	5.4	51	100	92	2.7	53	100	697	5.8	51
08:00:00	366	8.3	50	100	201	5.4	51	100	94	2.7	53	100	661	5.5	51
1ht:	**1481**				**792**				**358**				**2631**		
08:15:00	319	7.3	50	100	188	4.7	55	100	78	2.3	51	100	585	4.7	52
08:30:00	299	6.8	50	100	184	4.9	52	100	74	2.2	50	100	557	4.6	51
08:45:00	282	6.4	50	100	175	4.7	51	100	81	2.4	51	100	538	4.5	51
09:00:00	236	5.5	49	100	171	4.8	49	100	62	1.9	50	100	469	4.0	49
1ht:	**1136**				**718**				**295**				**2149**		
09:15:00	221	5.2	49	100	168	4.7	49	100	67	2.0	51	100	456	3.9	49

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-18-2012 06:00:00** **TO:** **10-18-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	188	2.8	93	100	143	2.8	79	100	331	2.8	87
06:30:00	275	4.1	91	100	183	3.7	76	100	458	3.9	85
06:45:00	300	4.5	90	100	198	3.8	79	100	498	4.2	86
07:00:00	383	5.7	93	100	258	5.1	78	100	641	5.4	87
1ht:	**1146**				**782**				**1928**		
07:15:00	434	6.6	91	100	291	5.9	75	100	725	6.2	85
07:30:00	473	7.1	91	100	308	6.0	78	100	781	6.6	86
07:45:00	503	7.7	89	100	314	6.3	75	100	817	7.0	84
08:00:00	460	7.0	90	100	300	5.9	77	100	760	6.5	85
1ht:	**1870**				**1213**				**3083**		
08:15:00	375	5.6	91	100	276	5.5	76	100	651	5.6	85
08:30:00	412	6.3	90	100	277	5.7	74	100	689	6.0	84
08:45:00	329	4.9	91	100	243	5.0	74	100	572	5.0	84
09:00:00	309	4.6	93	100	237	4.9	73	100	546	4.7	84
1ht:	**1425**				**1033**				**2458**		
09:15:00	303	4.7	89	100	228	4.7	74	100	531	4.7	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 06:00:00 **TO:** 10-18-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	113	1.9	69	100	140	2.6	73	100	45	0.9	74	100	298	1.8	72
06:30:00	178	2.9	69	100	186	3.6	71	100	56	1.2	72	100	420	2.6	70
06:45:00	159	2.6	70	97	201	3.9	70	97	40	0.8	73	97	400	2.4	71
07:00:00	254	4.1	71	100	252	4.8	73	100	77	1.5	76	100	583	3.5	72
1ht:	**705A**				**778A**				**219A**				**1702**		
07:15:00	267	4.2	72	100	245	4.6	73	100	97	2.0	74	100	609	3.6	73
07:30:00	279	4.5	71	100	266	5.0	73	100	93	1.8	78	100	638	3.8	73
07:45:00	289	4.7	70	100	257	4.8	74	100	69	1.4	74	100	615	3.6	72
08:00:00	267	4.3	71	100	254	4.6	76	100	73	1.4	79	100	594	3.4	74
1ht:	**1102**				**1022**				**332**				**2456**		
08:15:00	208	3.3	72	100	236	4.4	73	100	89	1.8	74	100	533	3.2	73
08:30:00	194	3.4	64	93	194	4.0	66	93	70	1.5	69	93	458	3.0	66
08:45:00	185	2.9	73	100	206	4.0	71	100	65	1.3	76	100	456	2.7	72
09:00:00	172	2.7	73	100	207	3.9	72	100	66	1.4	70	100	445	2.7	72
1ht:	**759A**				**844A**				**290A**				**1893**		
09:15:00	156	2.5	72	100	189	3.7	70	100	71	1.5	72	100	416	2.6	71

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	94	1.8	58	100	183	3.3	77	100	144	3.2	69	100	421	2.8	70
06:30:00	147	2.9	58	100	247	4.5	75	100	180	3.9	71	100	574	3.8	69
06:45:00	176	3.5	58	100	295	5.2	78	100	182	4.2	66	100	653	4.3	69
07:00:00	231	4.4	60	100	327	5.8	77	100	223	4.8	70	100	781	5.0	70
1ht:	**648**				**1052**				**729**				**2429**		
07:15:00	221	4.1	61	100	303	5.2	80	100	252	5.3	72	100	776	4.9	72
07:30:00	255	4.8	60	100	397	6.9	79	100	290	6.0	73	100	942	5.9	72
07:45:00	229	4.3	61	100	355	6.3	77	100	276	5.6	75	100	860	5.4	72
08:00:00	213	4.0	61	100	346	6.0	80	100	275	5.6	74	100	834	5.2	73
1ht:	**918**				**1401**				**1093**				**3412**		
08:15:00	185	3.5	60	100	315	5.3	81	100	255	5.4	71	100	755	4.8	73
08:30:00	157	3.0	60	97	274	4.9	77	97	243	5.5	67	97	674	4.4	70
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	125	2.4	59	97	264	4.8	75	97	231	5.1	69	97	620	4.1	70
1ht:	**625A**				**1139A**				**972A**				**2736**		
09:15:00	98	1.9	58	100	220	4.1	73	100	204	4.2	73	100	522	3.4	70

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
08:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	107	2.4	62	100	145	2.5	89	100	252	2.4	78
06:30:00	148	3.2	64	100	223	3.8	89	100	371	3.5	79
06:45:00	158	3.7	59	100	303	5.3	87	100	461	4.5	77
07:00:00	203	4.3	65	100	386	6.6	89	100	589	5.4	80
1ht:	**616**				**1057**				**1673**		
07:15:00	226	4.4	70	100	361	6.1	90	100	587	5.2	82
07:30:00	252	5.0	68	100	426	7.1	91	100	678	6.1	83
07:45:00	224	4.6	66	100	400	6.7	90	100	624	5.7	82
08:00:00	247	5.1	67	100	446	7.7	88	100	693	6.4	81
1ht:	**949**				**1633**				**2582**		
08:15:00	219	4.5	67	100	367	6.3	88	100	586	5.4	80
08:30:00	206	4.3	66	100	348	5.8	91	100	554	5.1	81
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	194	4.1	65	97	264	4.8	83	97	458	4.5	75
1ht:	**827A**				**1308A**				**2135**		
09:15:00	175	3.6	66	100	220	3.8	87	100	395	3.7	78

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	152	3.6	48	100	97	2.7	49	100	38	1.1	54	100	287	2.5	49
06:30:00	240	5.6	49	100	137	3.9	49	100	45	1.4	48	100	422	3.6	49
06:45:00	285	6.6	49	100	132	3.6	50	100	84	2.8	46	100	501	4.3	49
07:00:00	395	9.1	49	100	182	5.1	49	100	82	2.6	48	100	659	5.6	49
1ht:	**1072**				**548**				**249**				**1869**		
07:15:00	349	8.0	49	100	175	4.7	51	100	87	2.8	48	100	611	5.1	50
07:30:00	402	9.2	50	100	229	6.3	50	100	89	2.7	51	100	720	6.1	50
07:45:00	375	8.5	50	100	230	6.4	49	100	89	2.9	47	100	694	5.9	50
08:00:00	410	9.4	50	100	224	6.3	49	100	109	3.3	50	100	743	6.3	49
1ht:	**1536**				**858**				**374**				**2768**		
08:15:00	329	7.6	50	100	200	5.3	52	100	81	2.4	51	100	610	5.1	51
08:30:00	329	7.5	50	97	202	5.4	51	97	72	2.1	53	97	603	5.0	51
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	257	5.8	50	97	189	4.9	53	97	76	2.0	57	97	522	4.2	52
1ht:	**1220A**				**788A**				**305A**				**2313**		
09:15:00	243	5.6	50	100	170	4.3	54	100	59	1.6	55	100	472	3.8	52

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	162	2.4	93	100	150	2.9	78	100	312	2.6	86
06:30:00	279	4.1	93	100	181	3.5	79	100	460	3.8	88
06:45:00	312	4.8	90	100	221	4.4	77	100	533	4.6	85
07:00:00	427	6.3	92	100	279	5.3	80	100	706	5.8	87
1ht:	**1180**				**831**				**2011**		
07:15:00	382	5.6	93	100	295	5.5	81	100	677	5.6	88
07:30:00	462	7.2	87	100	322	6.2	79	100	784	6.7	84
07:45:00	452	6.8	92	100	308	6.0	79	100	760	6.4	86
08:00:00	488	7.5	89	100	313	6.3	76	100	801	6.9	84
1ht:	**1784**				**1238**				**3022**		
08:15:00	389	6.2	86	100	273	5.6	74	100	662	5.9	81
08:30:00	405	6.3	88	100	298	6.1	74	100	703	6.2	82
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	309	5.0	84	97	238	4.8	75	97	547	4.9	80
1ht:	**1474A**				**1080A**				**2554**		
09:15:00	274	4.4	85	100	267	5.1	79	100	541	4.8	82

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 06:00:00 **TO:** 10-23-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	114	1.8	71	100	143	2.8	69	100	37	0.8	75	100	294	1.8	70
06:30:00	158	2.6	70	100	194	3.6	75	100	52	1.1	69	100	404	2.4	72
06:45:00	184	3.0	69	100	221	4.2	73	100	70	1.6	67	100	475	2.9	71
07:00:00	281	4.4	73	100	261	5.0	72	100	76	1.7	70	100	618	3.7	72
1ht:	**737**				**819**				**235**				**1791**		
07:15:00	248	3.8	74	100	261	4.7	76	100	93	1.9	75	100	602	3.5	75
07:30:00	283	4.3	74	100	269	4.8	77	100	83	1.8	72	100	635	3.6	75
07:45:00	283	4.4	74	100	246	4.5	74	100	73	1.4	80	100	602	3.4	75
08:00:00	286	4.5	73	100	268	4.9	75	100	64	1.2	80	100	618	3.5	75
1ht:	**1100**				**1044**				**313**				**2457**		
08:15:00	232	3.7	71	100	244	4.6	73	100	73	1.5	74	100	549	3.3	72
08:30:00	250	4.0	71	100	263	5.0	73	100	81	1.7	72	100	594	3.6	72
08:45:00	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND	NA
09:00:00	101	1.9	60	47	176	3.6	68	47	34	1.0	53	47	311	2.1	64
1ht:	**858A**				**955A**				**276A**				**2089**		
09:15:00	100	1.8	63	77	145	3.0	65	77	48	1.1	69	77	293	2.0	65

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-24-2012 06:00:00** **TO:** **10-24-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	93	1.9	56	100	187	3.3	78	100	131	2.9	68	100	411	2.7	70
06:30:00	115	2.3	57	80	211	3.8	76	80	150	3.2	71	80	476	3.1	70
06:45:00	183	3.5	59	100	270	5.0	74	100	194	4.5	65	100	647	4.3	67
07:00:00	202	3.9	59	100	331	6.0	75	100	237	5.0	71	100	770	5.0	70
1ht:	**600A**				**1007A**				**718A**				**2325**		
07:15:00	203	4.0	59	100	315	5.5	79	100	248	5.2	72	100	766	4.9	71
07:30:00	240	4.7	59	97	339	6.1	77	97	262	5.6	71	97	841	5.4	70
07:45:00	205	3.9	60	93	301	5.1	80	93	249	5.5	68	93	755	4.9	71
08:00:00	204	3.8	61	93	321	5.6	79	93	221	4.7	71	93	746	4.7	72
1ht:	**851A**				**1277A**				**980A**				**3108**		
08:15:00	156	3.0	59	90	242	4.3	78	90	200	4.3	72	90	598	3.8	71
08:30:00	172	3.3	60	77	267	4.6	80	77	239	5.5	65	77	678	4.5	70
08:45:00	97	1.8	60	87	202	3.5	78	87	162	3.5	70	87	461	3.0	72
09:00:00	168	3.3	59	97	274	4.8	79	97	246	5.4	70	97	688	4.5	71
1ht:	**592A**				**986A**				**847A**				**2425**		
09:15:00	91	1.8	59	97	189	3.4	75	97	184	3.9	72	97	464	3.0	71

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
08:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
09:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-24-2012 06:00:00** **TO:** **10-24-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	114	2.4	66	100	160	2.7	90	100	274	2.5	80
06:30:00	145	3.2	62	93	238	4.0	90	93	383	3.6	79
06:45:00	166	3.7	62	100	299	5.2	87	100	465	4.4	78
07:00:00	202	4.2	65	100	394	6.7	89	100	596	5.5	81
1ht:	**627A**				**1093A**				**1720**		
07:15:00	188	3.8	67	100	347	5.9	90	100	535	4.9	82
07:30:00	236	4.9	65	100	433	7.2	91	100	669	6.1	82
07:45:00	248	5.1	66	97	446	7.6	89	97	694	6.4	81
08:00:00	244	5.0	66	100	432	7.4	89	100	676	6.2	81
1ht:	**916A**				**1657A**				**2573**		
08:15:00	239	5.1	64	97	369	6.3	89	97	608	5.7	79
08:30:00	227	4.7	66	90	341	5.8	90	90	568	5.2	80
08:45:00	203	4.3	65	97	341	5.7	91	97	544	5.0	81
09:00:00	218	4.6	65	100	295	5.0	90	100	513	4.8	79
1ht:	**886A**				**1345A**				**2231**		
09:15:00	163	3.4	65	100	241	4.0	91	100	404	3.7	80

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	150	3.6	48	100	101	2.8	50	100	30	1.2	38	100	281	2.5	48
06:30:00	231	5.4	49	90	138	3.8	50	90	67	2.5	40	90	436	3.9	48
06:45:00	269	6.2	49	100	140	3.9	50	100	79	3.0	40	100	488	4.4	48
07:00:00	381	8.8	50	100	194	5.2	51	100	89	3.0	45	100	664	5.7	49
1ht:	**1034A**				**573A**				**265A**				**1872**		
07:15:00	308	7.1	49	100	179	4.7	52	100	79	2.6	47	100	566	4.8	50
07:30:00	396	9.2	49	100	213	5.8	50	100	94	2.8	51	100	703	5.9	50
07:45:00	389	9.0	49	93	216	5.8	51	93	91	3.0	47	93	696	5.9	50
08:00:00	355	8.2	49	97	243	6.6	51	97	77	2.5	47	97	675	5.7	50
1ht:	**1446A**				**850A**				**341A**				**2637**		
08:15:00	313	7.2	50	90	194	5.1	53	90	89	2.8	48	90	596	5.0	50
08:30:00	345	7.9	50	87	186	4.8	53	87	88	2.6	51	87	619	5.1	51
08:45:00	309	7.0	50	97	187	4.9	52	97	93	2.7	53	97	589	4.9	51
09:00:00	307	6.9	51	100	208	5.4	53	100	74	2.1	55	100	589	4.8	52
1ht:	**1272A**				**777A**				**343A**				**2392**		
09:15:00	237	5.4	50	100	171	4.5	52	100	51	1.5	50	100	459	3.8	51

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	161	2.4	91	100	138	2.8	75	100	299	2.6	84
06:30:00	270	4.0	92	93	195	3.8	77	93	465	3.9	86
06:45:00	302	4.6	91	100	233	4.5	78	100	535	4.5	85
07:00:00	404	6.1	91	100	270	5.2	78	100	674	5.6	86
1ht:	**1138A**				**837A**				**1975**		
07:15:00	392	5.9	91	100	283	5.5	78	100	675	5.7	85
07:30:00	484	7.6	87	100	307	6.2	75	100	791	6.9	83
07:45:00	458	7.0	89	97	297	5.7	79	97	755	6.4	85
08:00:00	506	7.9	88	100	321	6.4	76	100	827	7.2	83
1ht:	**1840A**				**1208A**				**3048**		
08:15:00	388	6.0	89	97	307	6.2	75	97	695	6.1	83
08:30:00	419	6.6	87	90	260	5.4	73	90	679	6.0	82
08:45:00	377	5.9	88	97	259	5.3	74	97	636	5.6	82
09:00:00	345	5.2	90	100	264	5.4	75	100	609	5.3	83
1ht:	**1525A**				**1090A**				**2615**		
09:15:00	284	4.3	90	100	236	4.7	76	100	520	4.5	84

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 06:00:00 **TO:** 10-24-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	110	1.8	69	100	144	2.9	67	100	43	0.9	74	100	297	1.9	69
06:30:00	168	2.8	70	93	181	3.4	73	93	51	1.0	75	93	400	2.4	72
06:45:00	202	3.4	69	100	217	4.2	72	100	63	1.4	71	100	482	3.0	70
07:00:00	251	4.0	72	100	239	4.5	73	100	74	1.6	71	100	564	3.3	72
1ht:	**732A**				**782A**				**232A**				**1746**		
07:15:00	238	3.8	71	100	244	4.6	72	100	104	2.1	75	100	586	3.5	72
07:30:00	284	4.6	71	100	282	5.2	75	100	91	1.9	74	100	657	3.9	73
07:45:00	257	4.1	72	97	232	4.1	77	97	80	1.5	80	97	569	3.2	75
08:00:00	307	4.9	71	100	295	5.6	72	100	89	1.8	75	100	691	4.1	72
1ht:	**1086A**				**1054A**				**364A**				**2504**		
08:15:00	190	3.2	67	87	234	4.5	71	87	74	1.5	76	87	498	3.1	70
08:30:00	233	3.7	72	90	237	4.6	71	90	52	1.1	71	90	522	3.1	71
08:45:00	198	3.1	73	97	215	4.0	74	97	71	1.5	71	97	484	2.9	73
09:00:00	180	3.2	64	93	192	4.1	65	93	51	1.2	66	93	423	2.8	65
1ht:	**801A**				**876A**				**249A**				**1926**		
09:15:00	163	2.7	70	100	194	3.8	70	100	55	1.1	75	100	412	2.5	71

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	58	1.1	58	60	127	2.2	79	60	93	2.1	68	60	278	1.8	71
06:30:00	123	2.5	55	80	211	3.8	76	80	136	3.0	70	80	470	3.1	69
06:45:00	140	2.8	56	87	203	3.7	75	87	138	3.2	65	87	481	3.3	67
07:00:00	193	3.8	59	70	269	4.7	79	70	174	3.9	69	70	636	4.1	70
1ht:	**524A**				**821A**				**549A**				**1894**		
07:15:00	109	2.1	59	57	180	3.1	80	57	118	2.4	74	57	407	2.5	73
07:30:00	143	2.7	60	60	210	3.6	79	60	145	3.2	69	60	498	3.2	71
07:45:00	195	3.7	60	80	315	5.4	79	80	238	5.1	71	80	748	4.7	72
08:00:00	162	3.1	59	60	223	3.9	79	60	212	4.7	69	60	597	3.9	70
1ht:	**625A**				**957A**				**734A**				**2316**		
08:15:00	108	2.1	57	73	190	3.4	76	73	161	3.5	69	73	459	3.0	69
08:30:00	174	3.3	60	83	278	4.8	79	83	218	4.9	67	83	670	4.3	70
08:45:00	147	3.0	55	70	227	4.1	76	70	199	4.5	68	70	573	3.9	68
09:00:00	86	1.7	57	73	172	2.9	80	73	169	3.4	75	73	427	2.7	73
1ht:	**520A**				**875A**				**751A**				**2146**		
09:15:00	64	1.3	58	80	136	2.4	79	80	133	2.7	74	80	333	2.1	73

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
06:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
06:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
07:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
07:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
07:30:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
07:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
08:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:30:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
08:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
09:00:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
09:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-25-2012 06:00:00** **TO:** **10-25-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	116	2.4	66	100	148	2.5	91	100	264	2.5	80
06:30:00	137	3.0	63	90	217	3.8	88	90	354	3.4	78
06:45:00	164	3.7	61	100	279	4.8	88	100	443	4.2	78
07:00:00	188	4.0	64	100	405	7.0	88	100	593	5.5	80
1ht:	**606A**				**1053A**				**1659**		
07:15:00	205	4.2	66	93	363	6.1	91	93	568	5.2	82
07:30:00	261	5.3	68	90	453	7.7	90	90	714	6.5	82
07:45:00	237	4.8	67	97	409	7.1	88	97	646	6.0	80
08:00:00	224	4.5	69	90	409	6.9	90	90	633	5.7	82
1ht:	**926A**				**1632A**				**2558**		
08:15:00	203	4.3	65	97	342	5.9	89	97	545	5.1	80
08:30:00	207	4.2	67	100	345	5.8	90	100	552	5.0	82
08:45:00	193	4.3	61	100	316	5.4	89	100	509	4.9	78
09:00:00	170	3.5	67	90	278	4.5	94	90	448	4.0	84
1ht:	**775A**				**1285A**				**2060**		
09:15:00	168	3.4	67	97	207	3.5	90	97	375	3.5	80

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-25-2012 06:00:00** **TO:** **10-25-2012 09:15:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	111	2.6	48	90	76	2.1	49	90	38	1.2	47	90	225	2.0	48
06:30:00	202	4.7	49	83	114	3.0	53	83	54	1.8	45	83	370	3.2	50
06:45:00	239	5.5	50	93	123	3.5	49	93	62	2.2	44	93	424	3.7	49
07:00:00	308	7.0	50	93	156	4.2	51	93	66	2.2	47	93	530	4.5	50
1ht:	**864A**				**471A**				**221A**				**1556**		
07:15:00	232	5.3	50	63	137	3.6	52	63	74	2.2	51	63	443	3.7	51
07:30:00	403	9.2	50	77	211	5.6	52	77	78	2.4	50	77	692	5.7	51
07:45:00	316	7.1	51	80	171	4.4	53	80	79	2.3	52	80	566	4.6	52
08:00:00	333	7.6	50	80	165	4.2	54	80	84	2.6	49	80	582	4.8	51
1ht:	**1300A**				**691A**				**316A**				**2307**		
08:15:00	273	6.3	50	90	150	3.9	52	90	61	1.7	55	90	484	4.0	51
08:30:00	287	6.5	50	77	166	4.3	53	77	68	2.0	52	77	521	4.3	51
08:45:00	261	5.9	50	87	173	4.5	52	87	74	2.2	52	87	508	4.2	51
09:00:00	279	6.4	50	90	176	4.5	53	90	61	1.7	54	90	516	4.2	51
1ht:	**1099A**				**664A**				**263A**				**2026**		
09:15:00	176	4.0	50	77	128	3.4	51	77	50	1.4	53	77	354	2.9	51

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	180	2.7	93	100	153	2.9	80	100	333	2.8	87
06:30:00	241	3.5	94	90	177	3.3	81	90	418	3.4	89
06:45:00	327	4.9	92	100	214	4.2	77	100	541	4.5	86
07:00:00	422	6.3	92	100	276	5.2	80	100	698	5.8	87
1ht:	**1175A**				**823A**				**1998**		
07:15:00	409	6.0	93	93	271	5.4	77	93	680	5.7	87
07:30:00	440	7.1	85	87	321	6.4	76	87	761	6.7	81
07:45:00	434	6.5	91	97	312	5.9	81	97	746	6.2	87
08:00:00	454	6.7	92	90	269	5.1	80	90	723	5.9	88
1ht:	**1737A**				**1173A**				**2910**		
08:15:00	424	6.5	89	97	281	5.7	75	97	705	6.1	83
08:30:00	403	6.2	90	100	301	6.2	74	100	704	6.2	83
08:45:00	332	5.0	90	100	243	5.1	73	100	575	5.0	83
09:00:00	306	4.7	89	87	247	5.0	75	87	553	4.8	83
1ht:	**1471A**				**1075A**				**2546**		
09:15:00	282	4.2	93	97	223	4.4	77	97	505	4.3	86

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 06:00:00 **TO:** 10-25-2012 09:15:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
06:15:00	114	1.9	69	100	146	3.0	67	100	32	0.7	70	100	292	1.8	68
06:30:00	157	2.5	71	90	181	3.6	69	90	50	1.1	72	90	388	2.4	70
06:45:00	214	3.5	70	100	209	4.1	70	100	62	1.4	68	100	485	3.0	70
07:00:00	256	4.1	72	100	262	5.1	71	100	80	1.7	72	100	598	3.6	71
1ht:	**744A**				**800A**				**225A**				**1769**		
07:15:00	253	4.0	73	93	230	4.4	72	93	91	1.8	78	93	574	3.4	73
07:30:00	264	4.4	68	83	238	4.7	70	83	82	1.7	71	83	584	3.6	69
07:45:00	272	4.2	74	97	248	4.6	74	97	68	1.3	79	97	588	3.4	74
08:00:00	260	4.0	73	90	240	4.5	73	90	88	1.8	76	90	588	3.4	73
1ht:	**1049A**				**957A**				**328A**				**2334**		
08:15:00	258	4.2	69	97	253	5.0	69	97	92	1.9	72	97	603	3.7	70
08:30:00	221	3.6	70	90	233	4.8	67	90	71	1.6	68	90	525	3.3	68
08:45:00	193	3.2	70	83	194	4.0	67	83	48	1.1	66	83	435	2.7	68
09:00:00	166	2.6	72	80	189	3.8	69	80	44	0.9	76	80	399	2.4	71
1ht:	**848A**				**878A**				**261A**				**1987**		
09:15:00	147	2.3	72	87	197	3.9	70	87	57	1.2	71	87	401	2.5	71

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	163	3.1	60	100	299	5.5	74	100	277	6.2	68	100	739	4.9	69
15:30:00	156	3.1	57	100	300	5.3	78	100	273	6.0	69	100	729	4.8	70
15:45:00	151	3.0	57	100	300	5.3	78	100	250	5.5	70	100	701	4.6	70
16:00:00	200	3.9	59	100	320	5.6	78	100	293	6.4	69	100	813	5.3	70
1ht:	**670**				**1219**				**1093**				**2982**		
16:15:00	189	3.7	59	100	309	5.2	81	100	285	6.2	70	100	783	5.0	72
16:30:00	189	3.6	60	100	316	5.5	79	100	307	6.5	71	100	812	5.2	72
16:45:00	183	3.6	58	100	316	5.8	75	100	297	6.3	72	100	796	5.2	70
17:00:00	195	3.9	58	100	324	5.9	75	100	302	6.7	69	100	821	5.5	69
1ht:	**756**				**1265**				**1191**				**3212**		
17:15:00	194	3.7	59	100	290	5.3	75	100	258	5.5	71	100	742	4.8	69
17:30:00	225	4.3	59	100	345	6.1	77	100	288	6.2	71	100	858	5.5	71
17:45:00	214	4.1	59	97	325	5.8	77	97	277	6.1	69	97	816	5.3	69
18:00:00	181	3.6	58	100	265	4.8	75	100	236	5.2	69	100	682	4.5	68
1ht:	**814A**				**1224A**				**1059A**				**3097**		
18:15:00	158	3.1	59	100	282	5.0	77	100	271	5.8	71	100	711	4.6	70
18:30:00	110	2.1	59	100	255	4.6	76	100	235	5.1	70	100	600	4.0	70
18:45:00	134	2.7	57	100	238	4.4	73	100	223	5.0	68	100	595	4.0	68
19:00:00	107	2.2	56	100	219	4.0	75	100	185	4.0	70	100	511	3.4	69
1ht:	**509**				**994**				**914**				**2417**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:45:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
16:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA
16:45:00	0	0.0	NA	73	0	0.0	NA	73	0	0.0	NA
17:00:00	0	0.0	NA	87	0	0.0	NA	87	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
17:15:00	0	0.0	NA	73	0	0.0	NA	73	0	0.0	NA
17:30:00	0	0.0	NA	73	0	0.0	NA	73	0	0.0	NA
17:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	234	4.9	65	100	341	5.8	89	100	575	5.4	79
15:30:00	222	4.7	65	100	360	6.2	89	100	582	5.4	80
15:45:00	227	4.7	66	100	339	5.7	90	100	566	5.2	80
16:00:00	201	4.2	66	100	349	5.9	89	100	550	5.0	81
1ht:	**884**				**1389**				**2273**		
16:15:00	203	4.3	65	100	331	5.5	92	100	534	4.9	82
16:30:00	207	4.3	66	100	382	6.5	89	100	589	5.4	81
16:45:00	222	4.5	67	100	361	6.1	90	100	583	5.3	81
17:00:00	223	4.5	67	100	363	6.3	88	100	586	5.4	80
1ht:	**855**				**1437**				**2292**		
17:15:00	235	4.7	68	100	382	6.6	88	100	617	5.7	80
17:30:00	235	4.9	66	100	452	7.7	89	100	687	6.3	81
17:45:00	252	5.2	67	97	397	6.9	88	97	649	6.0	79
18:00:00	207	4.2	67	100	362	6.3	87	100	569	5.3	80
1ht:	**929A**				**1593A**				**2522**		
18:15:00	216	4.4	67	100	330	5.5	91	100	546	5.0	81
18:30:00	189	4.1	63	100	314	5.5	87	100	503	4.8	78
18:45:00	185	3.9	66	100	284	5.0	87	100	469	4.4	79
19:00:00	153	3.0	69	100	215	3.7	88	100	368	3.4	80
1ht:	**743**				**1143**				**1886**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	347	8.1	49	100	267	6.4	57	100	62	1.9	50	100	676	5.5	52
15:30:00	357	8.2	50	100	255	6.3	56	100	76	2.0	57	100	688	5.5	53
15:45:00	344	7.9	50	100	249	6.1	56	100	101	2.8	55	100	694	5.6	53
16:00:00	305	7.1	49	100	237	5.9	55	100	67	1.9	53	100	609	4.9	52
1ht:	**1353**				**1008**				**306**				**2667**		
16:15:00	339	7.8	50	100	251	6.0	57	100	81	2.2	55	100	671	5.4	53
16:30:00	374	8.7	49	100	262	6.3	57	100	95	2.7	53	100	731	5.9	53
16:45:00	334	7.7	50	100	260	6.3	57	100	85	2.4	54	100	679	5.4	53
17:00:00	339	7.8	50	100	254	6.0	58	100	77	2.1	55	100	670	5.3	54
1ht:	**1386**				**1027**				**338**				**2751**		
17:15:00	391	9.0	50	100	282	6.8	57	100	100	2.6	59	100	773	6.1	53
17:30:00	421	9.7	50	100	293	7.2	56	100	96	2.7	54	100	810	6.5	52
17:45:00	395	9.2	49	97	300	7.2	57	97	86	2.4	54	97	781	6.3	53
18:00:00	337	7.8	49	100	263	6.5	55	100	86	2.3	57	100	686	5.5	52
1ht:	**1544A**				**1137A**				**368A**				**3049**		
18:15:00	344	7.9	50	100	262	6.5	55	100	71	1.9	56	100	677	5.5	52
18:30:00	301	7.0	49	100	201	4.9	56	100	69	1.9	54	100	571	4.6	52
18:45:00	279	6.5	49	100	198	5.0	54	100	57	1.6	56	100	534	4.3	52
19:00:00	219	5.1	49	100	177	4.5	54	100	70	2.1	51	100	466	3.9	51
1ht:	**1143**				**838**				**267**				**2248**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	503	8.3	83	100	388	8.0	74	100	891	8.1	79
15:30:00	475	7.6	85	100	388	7.7	76	100	863	7.7	81
15:45:00	489	8.8	76	100	372	8.3	68	100	861	8.5	73
16:00:00	439	7.7	78	100	371	8.1	70	100	810	7.9	75
1ht:	**1906**				**1519**				**3425**		
16:15:00	463	7.5	85	100	360	7.3	75	100	823	7.4	81
16:30:00	494	8.0	84	100	395	7.9	76	100	889	8.0	80
16:45:00	500	8.0	85	100	367	7.3	77	100	867	7.7	81
17:00:00	522	8.5	84	100	407	8.1	77	100	929	8.3	81
1ht:	**1979**				**1529**				**3508**		
17:15:00	565	9.4	82	100	402	8.1	75	100	967	8.8	79
17:30:00	560	13.9	55	100	432	12.7	52	100	992	13.3	54
17:45:00	501	11.6	59	97	426	11.2	58	97	927	11.4	59
18:00:00	476	14.6	45	100	400	14.1	43	100	876	14.3	44
1ht:	**2103A**				**1660A**				**3763**		
18:15:00	490	8.3	81	100	411	8.7	72	100	901	8.5	77
18:30:00	451	7.5	83	100	332	6.9	73	100	783	7.2	79
18:45:00	415	6.4	88	100	302	5.7	80	100	717	6.1	85
19:00:00	316	4.8	90	100	276	5.2	81	100	592	5.0	86
1ht:	**1672**				**1321**				**2993**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-16-2012 15:00:00 **TO:** 10-16-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-16-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	273	4.5	69	100	272	5.2	72	100	105	2.2	72	100	650	4.0	71
15:30:00	253	4.2	69	100	272	5.2	71	100	105	2.3	71	100	630	3.9	70
15:45:00	283	4.6	70	100	271	5.3	70	100	134	2.8	72	100	688	4.2	71
16:00:00	269	4.4	69	100	265	5.1	71	100	108	2.3	72	100	642	3.9	70
1ht:	**1078**				**1080**				**452**				**2610**		
16:15:00	272	4.4	70	100	265	5.0	73	100	120	2.5	74	100	657	4.0	72
16:30:00	296	4.9	69	100	274	5.3	71	100	109	2.2	74	100	679	4.1	71
16:45:00	292	4.8	69	100	272	5.2	72	100	135	2.9	71	100	699	4.3	70
17:00:00	325	5.4	69	100	309	5.8	74	100	141	3.0	72	100	775	4.7	71
1ht:	**1185**				**1120**				**505**				**2810**		
17:15:00	365	6.4	65	100	314	6.0	71	100	130	2.7	72	100	809	5.1	69
17:30:00	346	14.3	28	100	283	9.0	43	100	148	3.7	61	100	777	9.0	40
17:45:00	337	6.1	63	97	277	5.5	69	97	151	3.2	72	97	765	4.9	67
18:00:00	296	5.5	61	100	268	5.5	67	100	136	2.9	72	100	700	4.6	65
1ht:	**1344A**				**1143A**				**565A**				**3052**		
18:15:00	290	4.9	68	100	266	5.2	71	100	123	2.4	77	100	679	4.2	71
18:30:00	277	4.6	68	100	263	5.2	70	100	110	2.3	71	100	650	4.0	69
18:45:00	213	3.6	68	100	239	4.5	73	100	99	2.1	72	100	551	3.4	71
19:00:00	181	3.0	69	100	188	3.6	72	100	99	2.1	72	100	468	2.9	71
1ht:	**961**				**956**				**431**				**2348**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	173	3.4	58	100	293	5.3	75	100	292	6.3	71	100	758	5.0	70
15:30:00	167	3.4	57	100	308	5.6	75	100	288	6.3	69	100	763	5.1	69
15:45:00	197	4.0	56	100	313	5.7	76	100	300	6.8	67	100	810	5.5	68
16:00:00	217	4.2	58	100	339	5.8	79	100	308	6.7	70	100	864	5.6	71
1ht:	**754**				**1253**				**1188**				**3195**		
16:15:00	174	3.3	59	100	307	5.5	76	100	292	6.4	69	100	773	5.1	70
16:30:00	196	3.8	59	100	310	5.6	76	100	307	6.6	71	100	813	5.3	70
16:45:00	221	4.4	58	100	344	6.2	76	100	311	6.8	70	100	876	5.8	69
17:00:00	217	4.2	59	100	329	5.9	77	100	331	7.4	68	100	877	5.8	69
1ht:	**808**				**1290**				**1241**				**3339**		
17:15:00	191	3.8	58	100	331	5.7	80	100	279	6.0	71	100	801	5.1	71
17:30:00	212	4.1	60	100	363	6.5	76	100	310	6.8	70	100	885	5.8	70
17:45:00	203	4.0	57	100	326	5.7	78	100	287	6.3	69	100	816	5.4	70
18:00:00	196	3.8	59	100	314	5.6	77	100	287	6.3	70	100	797	5.2	70
1ht:	**802**				**1334**				**1163**				**3299**		
18:15:00	171	3.3	59	100	276	5.0	76	100	247	5.4	70	100	694	4.6	70
18:30:00	183	3.6	58	100	300	5.5	75	100	268	5.7	71	100	751	4.9	70
18:45:00	171	3.5	57	100	279	5.2	73	100	260	5.9	67	100	710	4.9	67
19:00:00	145	2.9	58	100	248	4.4	77	100	232	5.1	70	100	625	4.1	70
1ht:	**670**				**1103**				**1007**				**2780**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
16:00:00	0	0.0	NA	63	0	0.0	NA	63	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
19:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	208	4.3	66	100	295	4.8	93	100	503	4.6	82
15:30:00	218	4.6	65	100	339	5.8	89	100	557	5.2	80
15:45:00	253	5.3	66	100	397	6.6	92	100	650	5.9	82
16:00:00	244	5.1	65	100	383	6.5	90	100	627	5.8	80
1ht:	**923**				**1414**				**2337**		
16:15:00	226	4.6	67	100	326	5.5	91	100	552	5.0	81
16:30:00	209	4.2	68	100	361	6.1	90	100	570	5.2	82
16:45:00	235	5.0	64	100	361	6.1	90	100	596	5.6	80
17:00:00	222	4.5	67	100	376	6.2	92	100	598	5.4	83
1ht:	**892**				**1424**				**2316**		
17:15:00	236	4.8	68	100	372	6.2	91	100	608	5.5	82
17:30:00	236	4.8	68	100	427	7.1	91	100	663	5.9	83
17:45:00	235	4.9	66	100	370	6.3	89	100	605	5.6	80
18:00:00	252	5.2	66	100	368	6.2	90	100	620	5.7	80
1ht:	**959**				**1537**				**2496**		
18:15:00	231	4.9	64	100	339	5.8	89	100	570	5.4	79
18:30:00	202	4.2	66	100	343	5.8	91	100	545	5.0	81
18:45:00	185	4.0	64	100	290	5.0	88	100	475	4.5	78
19:00:00	175	3.5	68	100	261	4.4	90	100	436	4.0	81
1ht:	**793**				**1233**				**2026**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	303	7.0	49	100	223	5.3	57	100	53	1.4	56	100	579	4.6	53
15:30:00	342	7.9	49	100	242	5.8	57	100	93	2.7	52	100	677	5.5	53
15:45:00	362	8.3	50	100	255	6.3	55	100	107	3.1	53	100	724	5.9	52
16:00:00	357	8.2	50	100	253	6.2	56	100	68	2.0	53	100	678	5.4	52
1ht:	**1364**				**973**				**321**				**2658**		
16:15:00	346	8.0	49	100	258	6.1	58	100	72	1.9	57	100	676	5.3	53
16:30:00	381	8.8	50	100	265	6.6	55	100	67	1.9	53	100	713	5.8	52
16:45:00	379	8.6	50	100	282	7.0	55	100	103	3.0	52	100	764	6.2	52
17:00:00	394	9.1	49	100	281	7.0	55	100	93	2.6	54	100	768	6.2	52
1ht:	**1500**				**1086**				**335**				**2921**		
17:15:00	362	8.3	50	100	255	6.2	57	100	91	2.5	54	100	708	5.7	53
17:30:00	429	10.0	49	100	276	6.7	57	100	107	2.9	56	100	812	6.5	53
17:45:00	404	9.3	50	100	285	7.1	55	100	89	2.5	55	100	778	6.3	52
18:00:00	377	8.7	49	100	283	7.0	56	100	86	2.5	51	100	746	6.1	52
1ht:	**1572**				**1099**				**373**				**3044**		
18:15:00	355	8.3	49	100	281	6.9	56	100	66	1.8	55	100	702	5.7	52
18:30:00	363	8.5	49	100	253	6.2	56	100	81	2.2	56	100	697	5.6	52
18:45:00	272	6.4	49	100	219	5.5	55	100	59	1.6	55	100	550	4.5	52
19:00:00	295	7.1	47	100	229	5.6	56	100	72	2.0	54	100	596	4.9	51
1ht:	**1285**				**982**				**278**				**2545**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	421	6.5	89	100	365	7.3	76	100	786	6.9	83
15:30:00	500	8.3	83	100	385	8.1	72	100	885	8.2	78
15:45:00	486	8.6	78	100	388	8.4	71	100	874	8.5	74
16:00:00	489	8.5	79	100	371	8.3	68	100	860	8.4	74
1ht:	**1896**				**1509**				**3405**		
16:15:00	479	7.6	86	100	358	7.2	76	100	837	7.4	82
16:30:00	495	8.6	79	100	402	8.6	71	100	897	8.6	75
16:45:00	514	8.3	84	100	381	7.6	76	100	895	8.0	81
17:00:00	501	8.3	83	100	394	8.3	72	100	895	8.3	78
1ht:	**1989**				**1535**				**3524**		
17:15:00	498	10.2	67	100	385	9.5	62	100	883	9.8	65
17:30:00	490	15.2	44	100	419	15.3	42	100	909	15.2	43
17:45:00	521	13.5	53	100	412	12.6	50	100	933	13.0	51
18:00:00	514	12.0	59	100	421	11.8	54	100	935	11.9	57
1ht:	**2023**				**1637**				**3660**		
18:15:00	467	13.2	49	100	385	13.0	45	100	852	13.1	47
18:30:00	463	7.5	85	100	381	7.5	77	100	844	7.5	81
18:45:00	414	6.6	86	100	334	6.7	76	100	748	6.6	81
19:00:00	365	5.6	90	100	326	6.3	79	100	691	5.9	85
1ht:	**1709**				**1426**				**3135**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-17-2012 15:00:00 **TO:** 10-17-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-17-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	237	4.2	65	90	242	4.7	70	90	119	2.7	67	90	598	3.9	67
15:30:00	294	5.0	67	100	303	5.9	70	100	111	2.2	75	100	708	4.4	70
15:45:00	266	4.4	70	100	252	4.6	75	100	104	2.2	71	100	622	3.7	72
16:00:00	289	4.8	69	100	276	5.3	71	100	117	2.4	73	100	682	4.2	71
1ht:	**1089A**				**1076A**				**450A**				**2615**		
16:15:00	296	4.9	69	100	272	5.0	74	100	108	2.2	74	100	676	4.0	72
16:30:00	313	5.2	69	100	278	5.2	73	100	141	2.9	74	100	732	4.4	72
16:45:00	277	4.8	66	83	253	5.0	69	83	136	2.9	70	83	666	4.3	68
17:00:00	303	5.0	69	100	295	5.5	73	100	128	2.6	76	100	726	4.4	72
1ht:	**1193A**				**1102A**				**511A**				**2806**		
17:15:00	353	6.3	64	100	298	5.8	70	100	143	2.9	74	100	794	5.0	68
17:30:00	282	22.0	15	100	243	20.0	17	100	172	8.6	30	100	697	16.9	19
17:45:00	280	23.4	14	100	233	19.8	16	100	198	8.6	35	100	711	17.3	20
18:00:00	334	15.2	25	100	251	12.1	28	100	159	5.1	47	100	744	10.8	31
1ht:	**1249**				**1025**				**672**				**2946**		
18:15:00	283	4.9	65	100	253	4.9	71	100	119	2.4	75	100	655	4.1	69
18:30:00	276	4.5	69	100	266	4.9	75	100	130	2.8	71	100	672	4.1	72
18:45:00	241	4.0	69	100	232	4.4	72	100	103	2.1	74	100	576	3.5	71
19:00:00	196	3.2	69	100	242	4.5	74	100	116	2.4	74	100	554	3.4	72
1ht:	**996**				**993**				**468**				**2457**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	186	3.5	60	100	315	5.8	74	100	288	6.2	70	100	789	5.2	70
15:30:00	180	3.6	57	100	329	5.9	76	100	303	6.7	69	100	812	5.4	69
15:45:00	178	3.5	58	100	329	6.0	75	100	318	6.9	70	100	825	5.5	69
16:00:00	198	3.8	60	100	322	5.7	78	100	282	6.4	67	100	802	5.3	70
1ht:	**742**				**1295**				**1191**				**3228**		
16:15:00	165	3.2	59	100	292	5.3	75	100	293	6.3	70	100	750	4.9	70
16:30:00	218	4.2	59	100	323	5.7	78	100	302	6.8	68	100	843	5.6	69
16:45:00	200	3.9	59	100	357	6.5	75	100	316	7.1	68	100	873	5.8	69
17:00:00	199	3.8	59	100	372	6.6	77	100	300	6.6	69	100	871	5.7	70
1ht:	**782**				**1344**				**1211**				**3337**		
17:15:00	180	3.5	59	100	334	6.0	76	100	283	6.1	70	100	797	5.2	70
17:30:00	253	4.9	59	100	369	6.4	79	100	316	6.8	70	100	938	6.1	70
17:45:00	222	4.4	58	100	347	6.1	78	100	305	6.9	67	100	874	5.8	69
18:00:00	261	5.1	58	100	338	6.0	77	100	272	6.0	69	100	871	5.7	69
1ht:	**916**				**1388**				**1176**				**3480**		
18:15:00	216	4.3	57	100	322	5.9	74	100	284	6.4	67	100	822	5.6	67
18:30:00	210	4.2	57	100	294	5.3	76	100	275	6.0	69	100	779	5.2	68
18:45:00	183	3.7	56	100	275	5.1	73	100	255	5.6	69	100	713	4.8	67
19:00:00	135	2.8	56	100	239	4.4	75	100	236	5.4	66	100	610	4.2	68
1ht:	**744**				**1130**				**1050**				**2924**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	43	0	0.0	NA	43	0	0.0	NA
17:45:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
18:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
18:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
19:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	219	4.7	63	100	351	6.0	89	100	570	5.4	79
15:30:00	205	4.3	66	100	327	5.6	89	100	532	4.9	80
15:45:00	235	4.8	67	100	369	6.3	89	100	604	5.6	80
16:00:00	216	4.6	65	100	351	6.3	85	100	567	5.4	77
1ht:	**875**				**1398**				**2273**		
16:15:00	197	4.1	65	100	344	5.9	88	100	541	5.0	80
16:30:00	226	4.8	64	100	374	6.5	87	100	600	5.7	79
16:45:00	239	5.1	64	100	395	6.8	88	100	634	6.0	79
17:00:00	237	4.9	67	100	378	6.5	89	100	615	5.7	80
1ht:	**899**				**1491**				**2390**		
17:15:00	222	4.6	66	100	329	5.7	88	100	551	5.1	79
17:30:00	258	5.1	69	100	461	7.9	88	100	719	6.5	81
17:45:00	269	5.9	62	100	443	7.9	85	100	712	6.9	77
18:00:00	261	5.8	61	100	437	7.9	84	100	698	6.9	75
1ht:	**1010**				**1670**				**2680**		
18:15:00	244	5.2	64	100	353	6.2	86	100	597	5.7	77
18:30:00	219	4.7	64	97	330	6.0	84	97	549	5.3	76
18:45:00	206	4.5	62	100	328	5.8	86	100	534	5.2	77
19:00:00	195	4.1	65	100	284	5.1	85	100	479	4.6	77
1ht:	**864A**				**1295A**				**2159**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	335	7.7	50	100	241	6.1	54	100	75	2.0	56	100	651	5.3	52
15:30:00	354	8.1	50	100	257	6.4	55	100	88	2.5	54	100	699	5.7	52
15:45:00	370	8.6	49	100	259	6.5	55	100	87	2.4	55	100	716	5.8	52
16:00:00	365	8.3	50	100	260	6.5	55	100	85	2.4	54	100	710	5.7	52
1ht:	**1424**				**1017**				**335**				**2776**		
16:15:00	338	7.7	50	100	278	6.8	56	100	88	2.5	54	100	704	5.7	53
16:30:00	381	8.8	49	100	257	6.4	55	100	82	2.4	53	100	720	5.9	52
16:45:00	363	8.3	50	100	250	6.3	55	100	105	3.0	53	100	718	5.9	52
17:00:00	348	8.1	49	100	257	6.4	55	100	90	2.6	53	100	695	5.7	52
1ht:	**1430**				**1042**				**365**				**2837**		
17:15:00	359	8.3	49	100	269	6.8	54	100	86	2.5	53	100	714	5.9	52
17:30:00	409	9.4	49	100	278	6.9	55	100	86	2.3	56	100	773	6.2	52
17:45:00	413	9.6	49	100	272	6.9	54	100	95	2.7	54	100	780	6.4	52
18:00:00	390	9.1	49	100	259	6.8	52	100	82	2.3	55	100	731	6.0	51
1ht:	**1571**				**1078**				**349**				**2998**		
18:15:00	353	8.2	49	100	260	6.9	52	100	79	2.2	56	100	692	5.7	51
18:30:00	335	8.0	48	100	296	7.8	52	100	91	2.4	57	100	722	6.1	51
18:45:00	325	7.6	49	100	244	6.6	51	100	63	1.7	57	100	632	5.3	50
19:00:00	305	7.2	48	100	218	6.1	49	100	76	2.1	55	100	599	5.1	49
1ht:	**1318**				**1018**				**309**				**2645**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	439	7.0	86	100	352	7.2	74	100	791	7.1	81
15:30:00	467	8.0	79	100	385	8.3	71	100	852	8.2	76
15:45:00	514	8.3	85	100	383	7.7	75	100	897	8.0	81
16:00:00	486	7.6	87	100	355	7.2	75	100	841	7.4	82
1ht:	**1906**				**1475**				**3381**		
16:15:00	479	7.8	84	100	375	7.6	75	100	854	7.7	80
16:30:00	535	9.4	78	100	401	8.8	70	100	936	9.1	74
16:45:00	486	9.8	68	100	371	8.7	65	100	857	9.3	66
17:00:00	499	15.5	44	100	430	14.9	44	100	929	15.2	44
1ht:	**1999**				**1577**				**3576**		
17:15:00	447	11.6	53	100	394	11.8	51	100	841	11.7	52
17:30:00	526	11.4	63	100	422	10.7	60	100	948	11.0	62
17:45:00	549	11.8	64	100	405	10.6	58	100	954	11.2	61
18:00:00	497	12.8	53	100	391	11.3	53	100	888	12.1	53
1ht:	**2019**				**1612**				**3631**		
18:15:00	476	15.1	43	100	398	14.8	41	100	874	14.9	42
18:30:00	455	13.4	47	100	392	13.4	44	100	847	13.4	46
18:45:00	445	10.6	57	100	360	10.2	54	100	805	10.4	56
19:00:00	445	7.3	84	100	345	6.9	76	100	790	7.1	81
1ht:	**1821**				**1495**				**3316**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-18-2012 15:00:00 **TO:** 10-18-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-18-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	270	4.5	69	100	265	5.2	69	100	128	2.7	72	100	663	4.1	70
15:30:00	269	4.4	69	100	258	5.1	69	100	116	2.6	69	100	643	4.0	69
15:45:00	290	4.8	70	100	275	5.2	72	100	97	2.0	75	100	662	4.0	71
16:00:00	285	4.6	70	100	262	5.0	71	100	136	3.0	69	100	683	4.2	70
1ht:	**1114**				**1060**				**477**				**2651**		
16:15:00	281	4.6	69	100	279	5.4	70	100	119	2.4	74	100	679	4.2	71
16:30:00	325	5.5	68	100	279	5.4	70	100	126	2.6	73	100	730	4.5	70
16:45:00	299	4.9	69	100	288	5.5	72	100	121	2.5	74	100	708	4.3	71
17:00:00	333	6.8	56	100	296	6.9	59	100	149	3.3	68	100	778	5.7	59
1ht:	**1238**				**1142**				**515**				**2895**		
17:15:00	276	17.5	18	100	220	14.4	21	100	202	6.3	49	100	698	12.7	28
17:30:00	258	24.6	12	100	204	25.1	11	100	205	12.3	25	100	667	20.7	16
17:45:00	261	24.5	12	100	211	23.4	12	100	216	10.9	30	100	688	19.6	18
18:00:00	271	23.4	13	100	225	22.9	13	100	183	8.2	34	100	679	18.1	19
1ht:	**1066**				**860**				**806**				**2732**		
18:15:00	272	21.6	14	100	230	23.4	13	100	163	7.5	33	100	665	17.5	19
18:30:00	266	6.5	47	97	254	6.8	51	97	99	2.2	68	97	619	5.2	52
18:45:00	253	4.3	68	100	232	4.6	69	100	125	2.7	70	100	610	3.9	69
19:00:00	240	4.0	69	100	235	4.5	71	100	115	2.5	71	100	590	3.7	70
1ht:	**1031A**				**951A**				**503A**				**2485**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 15:00:00 **TO:** 10-23-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	155	3.0	59	100	317	5.7	76	100	279	6.0	70	100	751	4.9	71
15:30:00	146	2.8	59	97	287	5.1	77	97	272	5.8	71	97	705	4.6	71
15:45:00	171	3.4	57	100	286	5.1	77	100	266	5.7	71	100	723	4.7	70
16:00:00	199	3.9	58	90	292	5.4	75	90	297	6.7	68	90	788	5.3	68
1ht:	**668A**				**1182A**				**1112A**				**2962**		
16:15:00	199	3.9	59	100	327	6.0	75	100	302	6.5	70	100	828	5.5	69
16:30:00	199	4.0	57	100	313	5.7	75	100	289	6.3	70	100	801	5.3	69
16:45:00	186	3.6	59	100	331	5.8	78	100	288	6.2	71	100	805	5.2	71
17:00:00	211	4.1	59	100	333	6.0	76	100	313	6.8	70	100	857	5.6	70
1ht:	**795**				**1304**				**1192**				**3291**		
17:15:00	218	4.3	58	100	333	5.9	77	100	297	6.5	69	100	848	5.6	70
17:30:00	234	4.5	60	100	333	5.8	78	100	279	6.2	69	100	846	5.5	70
17:45:00	220	4.2	60	100	345	6.2	76	100	288	6.5	68	100	853	5.6	69
18:00:00	189	3.7	58	100	289	5.1	78	100	266	5.9	69	100	744	4.9	70
1ht:	**861**				**1300**				**1130**				**3291**		
18:15:00	188	3.7	59	100	277	4.8	78	100	280	6.0	71	100	745	4.8	71
18:30:00	169	3.4	58	100	272	4.9	76	100	232	5.2	68	100	673	4.5	69
18:45:00	174	3.5	57	100	280	5.2	74	100	266	6.0	67	100	720	4.9	67
19:00:00	123	2.3	60	100	243	4.5	74	100	233	5.1	69	100	599	4.0	69
1ht:	**654**				**1072**				**1011**				**2737**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 15:00:00 **TO:** 10-23-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
15:30:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
15:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:00:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
19:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: **10-23-2012 15:00:00** **TO:** **10-23-2012 19:00:00**

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	216	4.4	67	100	313	5.2	91	100	529	4.8	81
15:30:00	228	4.8	65	97	347	6.0	89	97	575	5.4	79
15:45:00	209	4.3	66	100	303	5.2	89	100	512	4.7	80
16:00:00	234	5.3	60	93	355	6.4	85	93	589	5.8	75
1ht:	**885A**				**1315A**				**2200**		
16:15:00	245	4.9	69	100	359	6.2	88	100	604	5.5	80
16:30:00	211	4.4	65	100	335	5.8	88	100	546	5.1	79
16:45:00	233	4.7	67	100	368	6.2	91	100	601	5.4	82
17:00:00	236	5.0	65	100	359	6.0	90	100	595	5.5	80
1ht:	**925**				**1421**				**2346**		
17:15:00	249	5.1	67	100	391	6.7	89	100	640	5.9	81
17:30:00	226	4.7	66	100	410	7.0	89	100	636	5.8	81
17:45:00	252	5.3	65	100	407	7.0	88	100	659	6.1	80
18:00:00	223	4.5	67	100	351	6.1	88	100	574	5.3	80
1ht:	**950**				**1559**				**2509**		
18:15:00	214	4.5	65	100	329	5.6	89	100	543	5.1	79
18:30:00	192	4.0	66	100	354	6.2	87	100	546	5.1	80
18:45:00	196	4.3	63	100	311	5.5	85	100	507	4.9	77
19:00:00	183	3.9	64	100	272	4.7	88	100	455	4.3	79
1ht:	**785**				**1266**				**2051**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 15:00:00 **TO:** 10-23-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	358	8.1	50	100	260	6.4	56	100	79	2.1	57	100	697	5.5	53
15:30:00	360	8.2	50	93	249	6.1	56	93	86	2.3	57	93	695	5.5	53
15:45:00	359	8.2	50	100	248	6.1	56	100	114	3.1	57	100	721	5.8	53
16:00:00	402	9.3	49	93	271	7.1	52	93	74	2.0	57	93	747	6.1	51
1ht:	**1477A**				**1027A**				**354A**				**2858**		
16:15:00	389	8.9	50	100	317	7.8	56	100	69	2.0	52	100	775	6.2	52
16:30:00	367	8.4	50	100	273	6.7	55	100	100	2.9	53	100	740	6.0	52
16:45:00	384	8.7	50	100	286	7.1	55	100	106	3.0	54	100	776	6.3	53
17:00:00	406	9.3	50	100	298	7.5	54	100	87	2.4	56	100	791	6.4	52
1ht:	**1546**				**1174**				**362**				**3082**		
17:15:00	435	9.9	50	100	301	7.4	56	100	100	2.7	57	100	836	6.6	53
17:30:00	423	9.8	49	100	295	7.6	53	100	108	3.0	54	100	826	6.8	51
17:45:00	417	9.6	50	100	292	7.2	55	100	106	3.0	55	100	815	6.6	52
18:00:00	351	8.1	50	97	273	6.8	55	97	87	2.6	52	97	711	5.8	52
1ht:	**1628A**				**1162A**				**401A**				**3191**		
18:15:00	383	8.8	50	100	280	7.2	54	100	78	2.2	54	100	741	6.0	52
18:30:00	360	8.3	50	100	249	6.4	53	100	94	2.7	52	100	703	5.8	51
18:45:00	314	7.3	49	100	219	5.7	52	100	80	2.5	49	100	613	5.2	50
19:00:00	317	7.3	49	100	215	5.6	53	100	78	2.6	46	100	610	5.2	50
1ht:	**1374**				**963**				**330**				**2667**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 15:00:00 **TO:** 10-23-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	465	7.6	84	100	381	7.7	75	100	846	7.7	80
15:30:00	486	7.8	85	97	374	7.7	74	97	860	7.7	81
15:45:00	443	7.2	84	100	353	7.2	75	100	796	7.2	80
16:00:00	512	8.7	81	93	388	8.4	70	93	900	8.5	76
1ht:	**1904A**				**1495A**				**3399**		
16:15:00	492	8.6	79	100	398	8.5	71	100	890	8.5	75
16:30:00	491	8.3	81	100	406	8.4	74	100	897	8.3	78
16:45:00	492	8.1	84	100	384	7.8	75	100	876	7.9	80
17:00:00	506	8.8	79	100	407	8.7	71	100	913	8.7	76
1ht:	**1981**				**1595**				**3576**		
17:15:00	553	11.1	68	100	441	10.4	65	100	994	10.7	67
17:30:00	495	12.8	53	100	393	11.8	51	100	888	12.3	52
17:45:00	518	13.1	54	100	407	11.9	52	100	925	12.5	53
18:00:00	484	13.0	51	100	404	12.4	49	100	888	12.7	50
1ht:	**2050**				**1645**				**3695**		
18:15:00	476	9.8	67	100	393	10.2	59	100	869	10.0	63
18:30:00	481	8.4	79	100	374	8.1	70	100	855	8.2	75
18:45:00	382	6.1	86	100	324	6.2	79	100	706	6.2	83
19:00:00	363	5.6	89	100	330	6.4	79	100	693	6.0	84
1ht:	**1702**				**1421**				**3123**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-23-2012 15:00:00 **TO:** 10-23-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-23-2012 TUESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	257	4.3	69	100	274	5.2	72	100	102	2.1	73	100	633	3.9	71
15:30:00	282	4.7	68	97	289	5.4	74	97	112	2.3	73	97	683	4.1	71
15:45:00	260	4.4	68	100	258	4.9	72	100	117	2.4	73	100	635	3.9	71
16:00:00	319	5.6	65	93	258	5.3	67	93	107	2.4	69	93	684	4.4	66
1ht:	**1116A**				**1079A**				**438A**				**2633**		
16:15:00	271	4.5	68	100	304	5.9	71	100	115	2.3	75	100	690	4.2	70
16:30:00	293	4.9	68	100	271	5.1	73	100	139	2.9	72	100	703	4.3	71
16:45:00	295	4.9	69	100	269	5.2	71	100	130	2.7	73	100	694	4.3	70
17:00:00	292	4.9	68	100	287	5.6	71	100	127	2.6	75	100	706	4.3	70
1ht:	**1151**				**1131**				**511**				**2793**		
17:15:00	354	6.2	65	100	301	5.8	71	100	164	3.3	75	100	819	5.1	69
17:30:00	319	12.5	29	100	262	9.4	38	100	161	4.2	59	100	742	8.7	39
17:45:00	296	18.4	18	100	240	14.5	23	100	169	5.4	47	100	705	12.8	27
18:00:00	314	6.6	54	100	254	5.6	62	100	149	3.2	70	100	717	5.2	60
1ht:	**1283**				**1057**				**643**				**2983**		
18:15:00	261	4.4	68	100	260	5.1	70	100	131	2.8	71	100	652	4.1	69
18:30:00	285	4.9	67	100	266	5.3	68	100	131	2.8	72	100	682	4.3	68
18:45:00	213	3.6	67	100	242	4.5	73	100	113	2.4	73	100	568	3.5	71
19:00:00	208	3.5	68	100	227	4.4	70	100	98	2.0	74	100	533	3.3	70
1ht:	**967**				**995**				**473**				**2435**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	168	3.4	56	100	315	5.6	77	100	280	6.2	68	100	763	5.1	69
15:30:00	153	3.0	58	80	293	5.2	77	80	261	5.9	67	80	707	4.7	69
15:45:00	146	3.0	56	83	227	4.0	78	83	239	5.3	68	83	612	4.1	69
16:00:00	205	4.1	57	100	315	5.6	76	100	298	6.4	70	100	818	5.4	69
1ht:	**679A**				**1159A**				**1086A**				**2924**		
16:15:00	175	3.5	57	97	280	5.2	74	97	261	5.9	67	97	716	4.9	68
16:30:00	162	3.3	57	97	268	4.6	79	97	261	5.7	70	97	691	4.5	70
16:45:00	139	2.8	57	70	231	4.2	76	70	230	4.9	72	70	600	3.9	70
17:00:00	173	3.3	59	83	295	5.4	75	83	265	5.8	69	83	733	4.8	69
1ht:	**654A**				**1082A**				**1022A**				**2758**		
17:15:00	150	2.9	60	80	221	4.0	76	80	214	4.6	71	80	585	3.8	70
17:30:00	204	4.1	57	90	322	5.6	79	90	249	5.3	72	90	775	5.0	71
17:45:00	193	3.8	58	87	283	5.2	74	87	276	6.2	68	87	752	5.1	68
18:00:00	201	3.9	60	100	316	5.9	74	100	264	5.9	68	100	781	5.2	68
1ht:	**754A**				**1153A**				**1007A**				**2914**		
18:15:00	158	3.1	58	83	229	4.3	73	83	209	4.6	69	83	596	4.0	68
18:30:00	160	3.2	57	93	282	5.2	75	93	249	5.6	68	93	691	4.6	68
18:45:00	133	2.7	56	83	230	4.2	75	83	198	4.6	66	83	561	3.8	67
19:00:00	137	2.8	57	87	243	4.5	74	87	239	5.6	65	87	619	4.3	66
1ht:	**590A**				**989A**				**898A**				**2477**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
15:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
17:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
18:15:00	0	0.0	NA	90	0	0.0	NA	90	0	0.0	NA
18:30:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
18:45:00	0	0.0	NA	83	0	0.0	NA	83	0	0.0	NA
19:00:00	0	0.0	NA	97	0	0.0	NA	97	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	209	4.5	64	100	312	5.3	90	100	521	4.9	80
15:30:00	226	4.5	69	93	349	5.9	90	93	575	5.2	82
15:45:00	230	4.8	66	100	353	6.1	87	100	583	5.5	79
16:00:00	222	4.7	64	100	359	6.1	89	100	581	5.4	79
1ht:	**887A**				**1373A**				**2260**		
16:15:00	216	4.5	65	100	345	6.1	86	100	561	5.3	78
16:30:00	212	4.3	68	100	335	5.8	88	100	547	5.0	80
16:45:00	230	4.8	65	93	373	6.5	87	93	603	5.7	79
17:00:00	241	5.0	66	97	378	6.4	90	97	619	5.7	80
1ht:	**898A**				**1429A**				**2327**		
17:15:00	236	4.8	68	100	360	6.2	89	100	596	5.5	80
17:30:00	249	5.1	66	100	422	7.4	87	100	671	6.3	79
17:45:00	248	5.3	64	97	413	7.1	89	97	661	6.2	80
18:00:00	228	4.7	67	100	369	6.5	87	100	597	5.6	79
1ht:	**961A**				**1563A**				**2524**		
18:15:00	211	4.3	68	100	318	5.5	89	100	529	4.9	80
18:30:00	200	4.1	67	93	343	5.9	88	93	543	5.0	80
18:45:00	215	4.5	65	87	322	5.7	86	87	537	5.1	78
19:00:00	176	3.6	66	97	260	4.6	87	97	436	4.1	78
1ht:	**801A**				**1240A**				**2041**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	334	7.6	50	97	247	6.2	54	97	70	2.0	55	97	651	5.3	52
15:30:00	378	8.7	50	93	257	6.5	54	93	105	2.8	58	93	740	6.0	52
15:45:00	353	8.1	50	90	249	6.2	55	90	80	2.2	56	90	682	5.5	52
16:00:00	328	7.5	50	90	262	6.5	55	90	90	2.4	56	90	680	5.5	53
1ht:	**1394A**				**1015A**				**345A**				**2754**		
16:15:00	388	9.0	49	100	297	7.4	55	100	86	2.5	53	100	771	6.3	52
16:30:00	301	7.0	49	93	238	6.2	53	93	68	1.9	53	93	607	5.0	51
16:45:00	316	7.3	50	77	210	5.4	53	77	68	1.9	56	77	594	4.8	51
17:00:00	343	7.9	50	77	258	6.5	54	77	73	2.1	54	77	674	5.5	52
1ht:	**1355A**				**1013A**				**297A**				**2665**		
17:15:00	337	7.7	50	90	260	6.2	57	90	76	2.1	56	90	673	5.3	53
17:30:00	388	8.8	50	93	268	6.5	56	93	105	2.9	54	93	761	6.1	53
17:45:00	359	8.2	50	90	244	6.2	54	90	94	2.6	56	90	697	5.6	52
18:00:00	373	8.6	50	97	251	6.3	54	97	91	2.5	56	97	715	5.8	52
1ht:	**1458A**				**1024A**				**366A**				**2848**		
18:15:00	313	7.1	50	97	263	6.5	55	97	69	1.8	58	97	645	5.1	53
18:30:00	384	8.9	49	93	258	6.6	53	93	76	2.2	52	93	718	5.9	51
18:45:00	320	7.3	50	87	215	5.7	52	87	73	2.0	56	87	608	5.0	51
19:00:00	280	6.4	50	90	210	5.3	54	90	64	1.8	54	90	554	4.5	52
1ht:	**1298A**				**949A**				**283A**				**2530**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	486	8.0	83	100	365	7.7	72	100	851	7.9	78
15:30:00	467	7.5	85	93	354	7.1	75	93	821	7.3	81
15:45:00	514	9.0	78	100	396	8.6	70	100	910	8.8	75
16:00:00	478	11.7	56	100	377	11.0	52	100	855	11.3	54
1ht:	**1946A**				**1493A**				**3439**		
16:15:00	486	12.2	55	100	386	11.5	51	100	872	11.8	53
16:30:00	458	12.3	51	100	395	11.6	52	100	853	11.9	51
16:45:00	471	15.2	42	93	392	14.2	42	93	863	14.7	42
17:00:00	498	12.6	54	97	403	11.9	52	97	901	12.2	53
1ht:	**1913A**				**1576A**				**3489**		
17:15:00	521	13.4	53	100	421	12.6	51	100	942	13.0	52
17:30:00	503	13.8	50	100	404	12.5	49	100	907	13.2	49
17:45:00	526	11.6	62	97	406	10.9	56	97	932	11.3	60
18:00:00	500	11.6	59	100	400	11.3	54	100	900	11.5	57
1ht:	**2049A**				**1631A**				**3680**		
18:15:00	460	10.5	60	100	398	10.6	57	100	858	10.5	59
18:30:00	489	12.0	56	93	413	11.8	53	93	902	11.9	54
18:45:00	384	6.2	85	87	336	6.6	78	87	720	6.4	82
19:00:00	388	6.0	88	97	331	6.5	78	97	719	6.3	83
1ht:	**1725A**				**1480A**				**3205**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-24-2012 15:00:00 **TO:** 10-24-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-24-2012 WEDNESDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	272	4.6	68	100	278	5.6	68	100	94	1.9	74	100	644	4.0	69
15:30:00	265	4.6	66	93	237	4.6	70	93	111	2.5	69	93	613	3.9	68
15:45:00	323	5.6	66	100	295	5.8	69	100	121	2.6	70	100	739	4.7	68
16:00:00	274	6.2	50	90	241	5.8	57	90	116	2.8	63	90	631	4.9	55
1ht:	**1136A**				**1055A**				**441A**				**2632**		
16:15:00	311	11.3	31	100	263	8.4	43	100	131	3.2	62	100	705	7.6	41
16:30:00	314	11.6	31	100	270	8.8	42	100	115	2.9	61	100	699	7.7	40
16:45:00	286	10.3	32	93	246	8.2	41	93	144	3.6	61	93	676	7.4	41
17:00:00	299	17.2	20	97	249	11.3	30	97	164	4.5	55	97	712	11.0	32
1ht:	**1211A**				**1030A**				**553A**				**2794**		
17:15:00	308	25.1	14	100	243	22.2	15	100	185	7.3	38	100	736	18.2	20
17:30:00	279	26.0	12	100	225	25.4	12	100	204	13.1	24	100	708	21.5	15
17:45:00	292	25.4	13	97	219	23.4	13	97	226	12.5	27	97	737	20.5	17
18:00:00	289	18.4	18	100	247	17.5	19	100	160	4.9	49	100	696	13.6	26
1ht:	**1168A**				**935A**				**773A**				**2876**		
18:15:00	298	6.3	54	100	280	6.4	59	100	114	2.4	72	100	692	5.1	59
18:30:00	272	5.3	58	93	248	5.4	63	93	124	2.7	71	93	644	4.4	63
18:45:00	218	3.6	69	87	231	4.5	70	87	111	2.3	73	87	560	3.5	70
19:00:00	219	3.6	69	97	224	4.3	71	97	107	2.3	71	97	550	3.4	70
1ht:	**1012A**				**985A**				**456A**				**2453**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 26.25 **M .5 E/O DEL R**

Main Line / HOV

VDS ID: 819349

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	204	4.1	56	100	343	6.2	76	100	325	7.4	67	100	872	5.9	68
15:30:00	198	4.0	57	100	315	5.7	76	100	287	6.4	68	100	800	5.4	68
15:45:00	201	3.9	59	93	319	5.5	80	93	287	6.5	68	93	807	5.3	70
16:00:00	187	3.7	57	100	313	5.5	78	100	311	6.8	70	100	811	5.3	70
1ht:	**790A**				**1291A**				**1211A**				**3292**		
16:15:00	183	3.6	58	100	341	6.0	78	100	280	6.2	69	100	804	5.3	70
16:30:00	173	3.5	56	100	315	5.6	78	100	293	6.2	72	100	781	5.1	71
16:45:00	215	4.3	58	100	324	5.6	79	100	299	6.6	69	100	838	5.5	70
17:00:00	206	4.1	57	100	333	6.0	75	100	282	6.2	69	100	821	5.5	69
1ht:	**777**				**1313**				**1154**				**3244**		
17:15:00	211	4.2	57	100	340	6.0	78	100	297	6.4	70	100	848	5.5	70
17:30:00	254	5.0	58	100	372	6.9	74	100	296	6.6	68	100	922	6.1	68
17:45:00	228	4.5	58	100	330	5.8	78	100	307	6.6	71	100	865	5.6	70
18:00:00	200	4.0	57	100	308	5.6	75	100	280	6.2	69	100	788	5.3	68
1ht:	**893**				**1350**				**1180**				**3423**		
18:15:00	199	4.1	55	100	284	5.0	78	100	282	6.2	69	100	765	5.1	69
18:30:00	187	3.9	55	100	302	5.6	74	100	264	5.9	68	100	753	5.1	67
18:45:00	173	3.5	57	93	280	5.1	75	93	255	5.7	68	93	708	4.8	68
19:00:00	157	3.3	55	100	262	4.8	74	100	240	5.4	67	100	659	4.5	67
1ht:	**716A**				**1128A**				**1041A**				**2885**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 27.80 **CENTRAL AVE**

Main Line / HOV

VDS ID: 819703

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
15:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
16:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		
16:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
16:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
17:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
17:45:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0**				**0**				**0**		
18:15:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:30:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
18:45:00	0	0.0	NA	93	0	0.0	NA	93	0	0.0	NA
19:00:00	0	0.0	NA	100	0	0.0	NA	100	0	0.0	NA
1ht:	**0A**				**0A**				**0**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 28.70 **330 JCT**

Main Line / HOV

VDS ID: 819709

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	225	4.8	65	100	369	6.2	90	100	594	5.5	81
15:30:00	219	4.6	65	100	352	5.9	91	100	571	5.2	81
15:45:00	219	4.7	64	93	371	6.2	91	93	590	5.4	81
16:00:00	223	4.6	66	100	353	6.0	90	100	576	5.3	81
1ht:	**886A**				**1444A**				**2330**		
16:15:00	218	4.6	65	100	348	5.9	90	100	566	5.2	81
16:30:00	225	4.7	66	100	352	6.0	90	100	577	5.3	80
16:45:00	218	4.6	65	100	370	6.3	89	100	588	5.5	80
17:00:00	225	4.8	64	100	381	6.4	91	100	606	5.6	81
1ht:	**886**				**1451**				**2337**		
17:15:00	253	5.2	67	100	365	6.2	90	100	618	5.7	80
17:30:00	223	4.7	64	100	454	7.9	87	100	677	6.3	80
17:45:00	222	4.7	64	100	397	6.8	89	100	619	5.8	80
18:00:00	239	5.1	64	100	375	6.5	87	100	614	5.8	78
1ht:	**937**				**1591**				**2528**		
18:15:00	222	4.6	66	100	333	5.9	86	100	555	5.2	78
18:30:00	207	4.5	63	100	330	5.7	87	100	537	5.1	78
18:45:00	186	4.1	62	93	306	5.4	87	93	492	4.7	77
19:00:00	193	4.3	62	100	267	4.7	87	100	460	4.5	77
1ht:	**809A**				**1237A**				**2046**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 30.11 **M .7 E/O BASEL**

Main Line / HOV

VDS ID: 819368

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	410	9.3	50	100	264	6.5	56	100	82	2.2	58	100	756	6.0	53
15:30:00	381	8.7	50	100	295	7.2	56	100	81	2.2	57	100	757	6.0	53
15:45:00	364	8.4	49	93	243	5.9	56	93	96	2.6	57	93	703	5.6	53
16:00:00	389	8.9	50	100	289	7.1	56	100	83	2.2	58	100	761	6.1	53
1ht:	**1546A**				**1093A**				**342A**				**2981**		
16:15:00	394	9.1	49	100	267	6.5	56	100	76	2.1	54	100	737	5.9	52
16:30:00	384	8.9	49	100	280	7.0	55	100	92	2.6	55	100	756	6.2	52
16:45:00	382	8.7	50	100	271	6.8	55	100	100	2.8	55	100	753	6.1	52
17:00:00	409	9.4	50	100	284	7.0	55	100	87	2.3	57	100	780	6.2	53
1ht:	**1569**				**1102**				**355**				**3026**		
17:15:00	372	8.6	49	100	275	6.8	55	100	83	2.2	56	100	730	5.9	52
17:30:00	446	10.2	50	100	297	7.3	55	100	97	2.6	57	100	840	6.7	53
17:45:00	406	9.2	50	100	296	7.5	54	100	111	3.0	56	100	813	6.6	52
18:00:00	402	9.3	50	100	284	7.1	55	100	89	2.6	53	100	775	6.3	52
1ht:	**1626**				**1152**				**380**				**3158**		
18:15:00	383	8.9	49	100	274	7.0	54	100	82	2.3	54	100	739	6.0	51
18:30:00	360	8.4	49	100	265	6.7	54	100	75	2.1	54	100	700	5.7	51
18:45:00	338	8.0	48	93	257	6.6	53	93	61	1.7	54	93	656	5.4	51
19:00:00	336	7.9	49	100	253	6.4	54	100	70	2.0	52	100	659	5.4	51
1ht:	**1418A**				**1049A**				**289A**				**2756**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 31.40 **SANTA ANA RIVE**

Main Line / HOV

VDS ID: 819717

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	525	8.9	81	100	364	8.0	70	100	889	8.4	76
15:30:00	493	8.4	80	100	406	8.6	72	100	899	8.5	76
15:45:00	458	7.4	85	93	343	6.9	76	93	801	7.1	81
16:00:00	483	8.0	83	100	382	7.7	75	100	865	7.8	80
1ht:	**1961A**				**1497A**				**3458**		
16:15:00	482	7.8	85	100	401	8.1	75	100	883	7.9	80
16:30:00	494	8.2	82	100	397	8.0	75	100	891	8.1	79
16:45:00	487	10.7	62	100	392	10.4	57	100	879	10.5	60
17:00:00	496	11.6	58	100	433	11.6	57	100	929	11.6	58
1ht:	**1959**				**1623**				**3582**		
17:15:00	463	13.9	46	100	396	13.7	44	100	859	13.8	45
17:30:00	521	11.2	64	100	405	10.7	58	100	926	10.9	61
17:45:00	496	12.2	56	100	418	12.1	52	100	914	12.1	54
18:00:00	482	12.9	51	100	403	12.4	50	100	885	12.6	50
1ht:	**1962**				**1622**				**3584**		
18:15:00	473	12.5	52	100	413	12.9	49	100	886	12.7	50
18:30:00	474	12.8	51	100	377	12.4	46	100	851	12.6	49
18:45:00	441	9.3	65	93	369	8.9	63	93	810	9.1	64
19:00:00	439	7.2	83	100	343	7.0	75	100	782	7.1	80
1ht:	**1828A**				**1502A**				**3330**		

TRAFFIC DATA REPORT
15 Minute Loop Data

FROM: 10-25-2012 15:00:00 **TO:** 10-25-2012 19:00:00

A = Adjusted , ND = No Data, NA = Not Applicable
All values are suspect until verified by Engineer

VDS DESCRIPTION: SBD-210-W, **PM:** R 32.60 **SAN BERNARDINO**

Main Line / HOV

VDS ID: 819728

OCT-25-2012 THURSDAY	ML 1 VOL	ML 1 OCC	ML 1 SPD	ML 1 %GD	ML 2 VOL	ML 2 OCC	ML 2 SPD	ML 2 %GD	ML 3 VOL	ML 3 OCC	ML 3 SPD	ML 3 %GD	ML STATION TOT VOL	ML STATION AVG OCC	ML STATION EST SPD
15:15:00	256	4.5	65	87	234	4.8	67	87	110	2.6	65	87	600	4.0	66
15:30:00	252	4.2	69	100	286	5.4	73	100	137	2.9	71	100	675	4.2	71
15:45:00	256	4.3	69	87	233	4.4	72	87	117	2.5	71	87	606	3.7	71
16:00:00	246	4.5	63	87	253	5.3	65	87	102	2.5	63	87	601	4.1	64
1ht:	**1010A**				**1011A**				**468A**				**2489**		
16:15:00	295	4.9	69	100	282	5.5	71	100	170	3.6	73	100	747	4.6	70
16:30:00	295	4.9	68	100	270	5.1	72	100	118	2.5	73	100	683	4.2	70
16:45:00	314	5.3	67	100	302	5.8	71	100	127	2.6	73	100	743	4.6	70
17:00:00	346	6.5	61	100	290	5.9	67	100	123	2.6	72	100	759	5.0	65
1ht:	**1250**				**1144**				**538**				**2932**		
17:15:00	287	14.3	23	100	241	12.7	26	100	130	5.1	39	100	658	10.7	27
17:30:00	262	26.1	11	100	210	26.5	11	100	196	13.0	23	100	668	21.9	15
17:45:00	295	20.0	17	100	246	17.1	20	100	185	7.4	38	100	726	14.8	23
18:00:00	288	9.2	36	100	228	6.2	50	100	145	3.6	62	100	661	6.3	46
1ht:	**1132**				**925**				**656**				**2713**		
18:15:00	313	6.5	55	100	269	5.9	62	100	138	3.1	69	100	720	5.2	60
18:30:00	288	5.0	66	100	264	5.4	68	100	121	2.6	71	100	673	4.3	68
18:45:00	261	4.6	65	93	237	4.7	68	93	101	2.2	69	93	599	3.8	67
19:00:00	255	4.5	65	100	242	4.9	68	100	109	2.4	69	100	606	3.9	67
1ht:	**1119A**				**1013A**				**470A**				**2602**		